

AUGUST 2007

Professional Safety

JOURNAL OF THE
AMERICAN SOCIETY
OF SAFETY ENGINEERS

Lean Concepts Opportunities for SH&E Professionals

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to Practice
Transferring Findings
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Professional Safety

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AMERICAN SOCIETY
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Professional Safety is a blind peer-reviewed journal published monthly by the American Society of Safety Engineers, the oldest and largest safety society. *Professional Safety* keeps the professional occupational SH&E specialist informed on developments in the research and technology of accident prevention, industry best practices and safety management techniques.

features

28 Professional Development **Lean Concepts: Opportunities for Safety Professionals**

By Fred A. Manuele

A lean endeavor seeks to eliminate activities or processes that consume resources, add cost or require unproductive time without creating value. The application of lean concepts throughout business and industry presents an opportunity for SH&E professionals to call management's attention to an element of waste that should be addressed in the lean process—waste arising from the direct and ancillary costs of accidents.

35 Injury Prevention **From Research to Practice: Strategies & Examples from NIOSH**

By Nancy Stout and DeLon Hull

Through the Research to Practice initiative, which integrates NIOSH's strategic goals of knowledge generation and knowledge transfer, NIOSH translates research findings, technologies and information into prevention practices and products that can be adopted in the workplace. The ultimate goal is to provide research results to users in a manner and format most useful to them.

39 Hazard Communication **Technology Safety Data Sheets: Moving Critical Safety Information Upstream to Design Engineers & Downstream to Workers**

By Magdy Akladios and Gary Winn

New technologies and processes can pose risks to users, much like those caused by exposure to chemicals. As part of the right-to-know concept, a standardized resource such as technology safety data sheets (TSDS) can provide workers with the adequate knowledge to protect themselves from those risks. This article describes TSDS and discusses how these tools can be used to educate managers, designers, engineers and other potential users on basic aspects of safety and health.



Cover: Photo highlights this issue's lead feature, "Lean Concepts: Opportunities for Safety Professionals" which discusses lean concepts and how SH&E professionals can use the application of these concepts to call management's attention to injury prevention.



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OF SAFETY ENGINEERS

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THIS IS MY PROFESSION.

THIS IS MY LEGACY.



Karl Jacobson

Senior Vice President, Loss Prevention
Liberty Mutual Group

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U.S. Homeland Security Sponsors National Preparedness Month's Ready Campaign

In September, Department of Homeland Security will sponsor National Preparedness Month. A



coalition of more than 625 organizations from national to local regions have pledged support. In its fourth consecutive year, the campaign encourages Americans to prepare for emergencies in their homes, communities and businesses. For the first time, the

month's schedule will focus on different areas of emergency preparedness:

- Sept. 1-8: Back-to-School (*Ready Kids*);
- Sept. 9-15: Business preparedness (*Ready Business*);
- Sept. 16-22: Multicultural preparedness (*Listo*);
- Sept. 23-30: Home and family preparedness, including pets, older citizens and individuals with disabilities and special needs (*Ready America*).

The *Ready* campaign, along with the Citizen Corps program, will work to encourage people to make a family emergency plan and have an emergency supply kit, be informed about threats that may affect them and take steps to become involved in community preparedness and response efforts. Coalition members will also distribute information and sponsor activities across the country to promote events. Groups can register to become coalition members by visiting www.ready.gov.

CPSC Warns of Carbon Monoxide Dangers from Generators

In emergency situations such as those caused by hurricanes and summer storms, consumers might resort to using gas generators as an alternative energy source. Consumer Product Safety Commission (CPSC) is warning consumers of the dangers of portable gas generators that can produce high levels of poisonous carbon monoxide (CO). CPSC is alerting the public to never use a generator inside homes, garages, crawl spaces, sheds or similar areas even when there is ventilation. Generators should only be used outdoors, far away from doors, windows and vents that could allow the odorless gas to enter indoor areas. According to CPSC, the amount of CO produced by one generator is approximately equal to that produced by hundreds of idling cars.

Deaths from CO exposure emitted by gas generators have risen 18% from 1999 to 2002. To warn and safeguard consumers who use portable generators, CPSC mandated that all generators manufactured or imported on or after May 14, 2007, bear a danger label warning about CO. In addition, CPSC is pursuing rulemaking to develop performance requirements or other strategies to lower the risk of

CO poisoning from portable generators. The agency has posted an alert at www.cpsc.org that provides suggestions for safe use.

Study Finds Employers Pay High Price for Vision Disorders

A study conducted by the Vision Council of America (VCA) shows that employees' vision disorders decrease productivity by about \$8 billion per year. Published in *Vision in Business*, the report examines the cost of vision problems and the role of preventive care to increase productivity and efficiency in the workplace. According to the report:

- 90% of the nearly 800,000 work-related eye injuries per year are preventable.
- 11 million Americans have uncorrected vision problems, from near-sightedness to glaucoma.
- Vision problems affect more than 120 million people, making it the second most prevalent health problem in the country.
- Nearly 90% of those who use a computer at least 3 hours a day suffer from vision problems associated with computer-related eye strain.

VCA encourages employees to maintain healthy vision by scheduling regular eye exams, wearing ANSI-approved protective eyewear, taking 20 second breaks every 20 minutes of computer use and using antireflective safety lens to reduce glare and fatigue. Employers are encouraged to offer vision coverage with their healthcare plans and ensure safe working environments with mandatory eye protection. For a copy of the report, visit www.checkyearly.com.

Study Finds Radioactive Waste Hexavalent Chromium in Water Causes Cancer in Lab Animals

When consumed in drinking water, chromium 6—known as hexavalent chromium—has been found to cause cancer in laboratory animals. National Toxicology Program (NTP) conducted a 2-year study that consisted of feeding male and female mice and rats four different doses of sodium dichromate dihydrate—an inorganic compound containing hexavalent chromium—which was contained in their drinking water. According to the National Institutes of Health, the lowest doses given to the animals were 10 times higher than what humans could consume from the most highly contaminated water sources. Researchers found increases in tumors in unlikely sites on the animals, such as the oral cavity in the rats and the small intestine in the mice. The report can be found at http://ntp.niehs.nih.gov/files/546_board_web.pdf.



Generators should only be used outdoors, far away from doors, windows and vents that could allow the odorless gas to enter indoor areas.

Our members recognize the vital role ASSE must perform in today's global economy. As a Society, we have a great opportunity to grow our influence as a world-renowned leader in SH&E.

Acting Globally: A View to the Future



Consider the possibilities. We are in a time of truly incredible change and challenge in our profession. Many factors are influencing SH&E performance—from changing geopolitical relationships and redistribution of businesses to emerging competition, social and environmental pressures, and demographic shifts.

These trends are transforming how we as SH&E professionals must prepare and practice—they are challenging our knowledge and skill sets and driving us to continually seek to better ourselves. I work in a truly global organization—one with more than 100,000 employees in more than 75 countries. I view the diversity of this workforce—its many languages, cultures and points of view with respect to SH&E—as a gift, one that continuously sharpens and hones my professional competencies, energy and commitment.

While many ASSE members work for smaller companies or are self-employed, they, too, are affected by what happens worldwide. The emergence of the global marketplace is altering traditional strategies and practices. We are part of businesses that have transactions around the world. As our employers and clients look to developing markets for greater profits, we also are seeing the far-reaching effects of SH&E laws and standards developed in other countries. The recent adoption of the Global Harmonization Standard is a prime example of a standard that crosses national borders.

Thinking globally, we must recognize one fact that affects our profession and our membership, now and in the future: Economists predict that the world population will reach 8 billion by 2030—up from 6.5 billion today—with 95% of that growth occurring in the developing world. As these developing countries seek to grow their economies, protecting people, property and environment is becoming critical to sustaining growth and creating a higher standard of living. As a result, our members are being asked to share their knowledge and expertise by participating in international conferences, seminars and professional development programs.

To meet these increasing demands and expectations, members are looking to ASSE to become an involved leader in the global arena. ASSE's strategic vision declares that we will "be a global champion of the safety, health and environmental professional, a global leader of the profession and a premier resource for those engaged in protecting people, property and the environment." This vision offers great opportunity for current and future members, and I am pleased that our members recognize the vital role ASSE must perform in the global economy.

As a Society, we have great opportunity to grow our influence as a world-renowned leader in SH&E. There is a growing population of connected SH&E professionals with whom we all can share ideas and information. Today, members in Ulysses, KS, Lima, Peru, or Perth, Australia, can connect through the Society to advance their careers, promote the profession and grow the global SH&E body of knowledge. ASSE also continues to collaborate with international professional organizations, governments and businesses to advance the profession and help businesses improve their SH&E performance.

ASSE members live and work in more than 75 countries. This creates an ever-increasing diversity of views among the membership about what the Society's vision really means to them. As members of various Society councils, committees and the Global Task Force gather in the coming year, they will discuss our global vision statement, strategically and tactically. They will seek to understand the benefits perceived and received by current and prospective SH&E professionals around the world. They will ask, "How will we and our Society be viewed as a viable player in the broader world of SH&E?" And they will consider the promotion of the profession globally and the alignment with members' needs and the needs of their customers.

These discussions and activities will not distract us from our current strategic goals or detract from our service to our members and their customers. Instead, these many discussions and individual dialogues will be additive, bringing new knowledge and perspectives about our vision. They may even lead to a new strategic goal.

All of this energy and momentum will contribute to the realization of ASSE's vision. Our members are ASSE and we will make a difference through our commitment to each other globally. Consider the possibilities!

Michael W. Thompson, CSP

Why Jon Turnipseed Has a Job

Jon Turnipseed, CSP, recently represented ASSE in a hearing before the House Education and Labor Subcommittee on Workforce Protections. In his testimony, he called for protection of the 8.5 million public sector workers who do not have occupational safety and health coverage. "The time has come to be fair to all those public sector workers who risk their well-being for all of us," he said. An edited version of his reading statement is presented here.

On May 24, Jon Turnipseed, CSP, represented ASSE in a hearing before the House Education and Labor Subcommittee on Workforce Protections. He also represented an estimated 8.5 million public sector workers who do not have the same occupational safety and health coverage that most of the rest of us have when we go to work each day. The subcommittee asked a good question: "Why do millions of workers remain without OSHA coverage?"

Sitting near Jon at the witness table that day was Casey Jones, the widow of a worker at the Daytona Beach, FL, municipal water plant who lost his life because, according to the U.S. Chemical Safety and Hazard Investigation Board (CSB), his employer did not give the most basic safety training to its employees. Florida did not require it, nor did the OSH Act, so the employer did not see fit to provide it. That left the worker and his two colleagues on their own that day as far as safety. One of them also died and the other was badly injured.

Jon also is a municipal water plant worker. But he is employed to help make sure his fellow workers' wives don't become widows. That's because California requires occupational safety and health coverage for its state and municipal workers. The stark contrast in the commitment to safety between Daytona Beach and San Bernardino could not have been more obvious as Jon's statement that day indicates (see below).

ASSE's members are working hard in Florida, with the help of a lobbyist, to see that the state corrects this in the 2008 legislative session. But the best answer is a federal correction to this loophole in the OSH Act. Senator Ted Kennedy (D-MA) and Representative Lynn Woolsey (D-CA) have introduced omnibus OSHA reform legislation that includes provisions to cover all public sector workers.

This issue has topped ASSE's legislative agenda for years. It finally has a real chance of moving forward. When it does, ASSE will ask for your support. In the meantime, take a few minutes to read what Jon had to say that day. This country's many public sector workers deserve to have a guy like him on the job with them.

Chairwoman Woolsey & Subcommittee Members:

I am Jon Turnipseed, and I am pleased to be here today representing the 30,000 members of ASSE, who have asked me to speak as strongly as I can in support of providing occupational safety and health coverage to all public sector workers, no matter where they work.

I am a public sector employee—safety supervisor for the City of San Bernardino Municipal Water Department in California. I see every day how important safety and health coverage is for my fellow workers. What Ms. Jones has gone through is something I work hard to prevent every day. My heart goes out to her.

Most people are shocked to learn that in 26 states, public sector employees are not guaranteed the same level of workplace safety protections that private sector workers have. They also do not understand the risks many government workers face on their behalf.

I have heard people say, "Working at a sewer plant surely can't be that dangerous." It is. And it is why San Bernardino hired me to make sure its workers follow OSHA standards.

Water and sewer workers enter hundreds of underground vaults, trenches and pits several hundred times

each year. On any given day, the potentially lethal atmosphere in a vault or similar confined space, or a trench collapse, can kill them. On the street level, these same workers also must direct traffic.

Water and wastewater treatment depend on electrical pumps and motors, so every day we face electrocution hazards. Potentially hazardous chemicals such as chlorine are used throughout water operations. Operating construction equipment such as backhoes and cranes is always risky. Office workers face everything from carpal tunnel injuries to assaults by angry customers.

People also fail to realize that many of these public sector workers without safety and health coverage are the first responders who rush in to disasters to help save their lives. Water and wastewater people are right in the middle of most disasters as well.

My experience shows only one example of the need for public sector coverage. People working in hundreds of other jobs within the government arena face many similar risks and deserve the same protections they would enjoy if they were private sector workers. Yet, more than 8.5 million of these workers remain without occupational safety and health coverage that meets federal OSHA standards.

The arguments against it—such as "unfunded mandates"; "it costs too much"; or "we don't need it because we take good care of our public employees anyway"—are not supportable. I understand "unfunded mandates." As a public employee, I also struggle to keep on top of ever-changing regulations. Yet, I accept that my job is to do my best to take care of San Bernardino's citizens. I do not shirk my duty.

As an SH&E professional, I reject that safety costs too much. Beyond meeting the moral duty to protect workers' lives, the best corporations know that investing in safety and health pays off in improving the bottom line. No doubt, taxpayers would like to know why their governments do not have this same understanding of safety and health payoff in the bottom line.

The number of deaths and injuries among public sector workers contradict the idea that they are taken care of. And, if a government entity's employees are well cared for, it would not cost more to follow OSHA standards because the investment in meeting those standards already would have been made. I have this coverage, and I know that San Bernardino is no less a good steward of taxpayers' hard-earned dollars than water departments where coverage is not provided.

In fact, the recent tragedy in Daytona Beach speaks volumes against each of these arguments. ASSE was at the CSB hearing on the accident in Daytona Beach. So were plaintiffs' lawyers for the victims. We know the tragic costs in lives. No doubt, the costs in taxpayer dollars to Daytona Beach for not meeting the most basic OSHA practices will be much higher than would have been the investment to meet those standards in the first place. Now, ASSE's Florida members are working to see that the state's legislature provides public sector coverage.

We understand, though, that the surest way to achieve coverage for every public sector worker is an amendment to the federal OSH Act. ASSE fully supports provisions to do this in your bill, Chairwoman Woolsey. The time has come to be fair to all those public sector workers who risk their well-being for all of us. ASSE stands ready to help.

"The mind is not a vessel to be filled but a fire to be kindled." —Plutarch

Featured Event



BETHESDA, MD

September 10-11

WORKLIFE 2007: PROTECTING & PROMOTING WORKER HEALTH SYMPOSIUM
NIOSH's 2-day symposium will explore strategies and deliver tools for enhancing and sustaining healthy workplaces and healthy workers. Join practitioners, policy makers and researchers to consider the latest findings, share best practices and identify practical ways to integrate occupational safety and health protection and health promotion practices.

Send event announcements to professionalsafety@asse.org.

August 20

AERIAL LIFT OPERATOR & TRAIN-THE-TRAINER course in Long Beach, CA. Contact Crane Tech; (800) 521-7669; www.cranetech.com.

August 20-22

■ **FRAME, TUBE & COUPLER SCAFFOLDING TRAINER** course in League City, TX. Contact Scaffold Training Institute; (800) 428-0162; info@scaffoldtraining.com; www.scaffoldtraining.com.

August 20-24

HAZARD EVALUATION: CONSEQUENCE ANALYSIS METHODS course in Knoxville, TN. Contact ABS Consulting Training Solutions; (800) 769-1199; www.absconsulting.com/training/services.

August 21-22

PORTABLE INSTRUMENT OPERATIONS TRAINING course in Cleveland, OH. Contact Industrial Scientific Corp.; (800) 338-3287; info@indsci.com; www.indsci.com.

August 22-23

HEARING CONSERVATION STRATEGIES course in Schaumburg, IL. Contact Acoustic Associates Ltd.; (847) 359-1068; seminars@acousticassociates.com; www.acousticassociates.com.

August 23-24

ESSENTIALS OF SAFETY seminar in San Antonio, TX. Contact American Safety Training; (800) 896-8867; www.trainosha.com.

August 23-25

■ **CSP EXAM PREPARATION** workshop in Reno, NV. Contact SPAN International Training; (888) 589-6757; www.spantraining.com.

August 27-29

20TH ANNUAL ALABAMA GOVERNOR'S SAFETY AND HEALTH CONFERENCE in Orange Beach, AL. Contact University of Alabama College of Continuing Studies; (866) 432-2015; <http://algovshc.ccs.ua.edu>.

August 27-30

ELECTRICAL SAFETY FOR INDUSTRIAL FACILITIES course in Dallas, TX. Contact AVO Training Institute; (877) 594-3156; www.avotraining.com.

August 27-31

■ **CERTIFIED BEHAVIORAL-BASED ERGONOMIC SPECIALIST CREDENTIALING** course in New Orleans, LA. Contact ISR Institute Inc.; (800) 414-2174 or (504) 733-2111; dr.bunch@isr-institute.com; www.isr-institute.com.

■ Current month advertiser

August 28-30

UPDATE FOR GENERAL INDUSTRY OUTREACH TRAINERS course in Raleigh, NC. Contact Georgia Tech OSHA Training Institute Education Center; (800) 653-3629; www.pe.gatech.edu.

August 29 - September 1

3RD INTERNATIONAL NANOTECHNOLOGY, OCCUPATIONAL & ENVIRONMENTAL HEALTH SYMPOSIUM in Taipei, Taiwan. Contact Emily Shih, conference secretariat; 866-2-2504-4338, ext. 18; emily@elitempc.com.tw; www.cce.umn.edu/conferences/nanotechnology.

August 30

OSHA 30-HOUR CONSTRUCTION SAFETY & HEALTH course in East Syracuse, NY. Contact Eileen Clinton, RRM Safety Center Inc.; (315) 432-8210; eclinton@bbempirestate.com.

September 3-5

INTERFLAM 2007: 11TH INTERNATIONAL CONFERENCE ON FIRE SCIENCE & ENGINEERING in London. Contact Interscience Communications; +44 (0)20 8692 5050; intercomm@dial.pipex.com; www.intercomm.dial.pipex.com.

September 4-6

MACHINERY & MACHINE GUARDING STANDARDS course in Richmond, KY. Contact OSHA Training Institute Eastern Kentucky University Education Center; (859) 622-8405; www.ceo.eku.edu/osha.

September 5-6

CONFINED SPACE METERING course in Oakdale, PA. Contact Industrial Scientific Corp.; (800) 338-3287; info@indsci.com; www.indsci.com.

September 5-7

FALL ARREST SYSTEMS course in Lakewood, CO. Contact OSHA Training Institute Rocky Mountain Education Center; (800) 933-8394 or (303) 914-6420; www.rrcc.edu/rmec.

September 6

ACCIDENT/INCIDENT INVESTIGATIONS course in Seattle, WA. Contact Evergreen Safety Council; (800) 521-0778 or (206) 382-4090; esc@esc.org; www.esc.org.

September 9

■ **SAFETY IN THE BALANCE: STRATEGIES & SKILLS FOR PREVENTING SLIPS, TRIPS & FALLS** technical audio-conference. Contact ASSE Customer Service Department; (847) 699-2929; customerservice@asse.org; www.asse.org.

September 9-15

■ **MATH REVIEW, ASP/CSP EXAM PREPARATION & SAFETY MANAGEMENT I** workshops in Phoenix, AZ. Contact ASSE Customer Service Department; (847) 699-2929; customerservice@asse.org; www.asse.org.

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WORKLIFE 2007: PROTECTING & PROMOTING WORKER HEALTH SYMPOSIUM in Bethesda, MD. Contact NIOSH; www.worklife2007.com.

September 10-12

PROCESS SAFETY MANAGEMENT course in Knoxville, TN. Contact ABS Consulting Training Solutions; (800) 769-1199; www.absconsulting.com/trainingservices.

September 10-13

GENERAL INDUSTRY TRAINER course in Phoenix, AZ. Contact David Bellmont, ASSE Arizona Chapter; (602) 631-2004; dbellmont@scfaz.com; <http://az.asse.org>.

September 10-13

ESSENTIALS OF SAFETY seminar in Miami, FL. Contact American Safety Training; (800) 896-8867; www.trainosha.com.

September 10-14

OSH STANDARDS FOR GENERAL INDUSTRY TRAINER course in Charleston, SC. Contact Georgia Tech OSHA Training Institute Education Center; (800) 653-3629; www.pe.gatech.edu.

September 11-13

OCCUPATIONAL NOISE EXPOSURE course in Indiana, PA. Contact Keystone Occupational Safety & Health Center at Indiana University of Pennsylvania; (800) 640-7421 or (724) 357-2292; www.koshcenter.org.

September 13-14

CONSTRUCTION SAFETY & HEALTH course in Lawrence, MA. Contact OSHA Training Institute New England Education Center; (800) 449-6742; oshaed@keene.edu; www.keene.edu/conted/osha.cfm.

September 13-16

ASCC ANNUAL CONFERENCE in Charlotte, NC. Contact American Society of Concrete Contractors; (866) 788-2722; www.asconline.org.

September 14

SAFETY, HEALTH & ENVIRONMENT CONFERENCE & EXPO in Baltimore, MD. Contact Chesapeake Region Safety Council; (800) 875-4770; safety@chesapeakeesc.org; www.chesapeakeesc.org.

September 14-15

ANNUAL OCCUPATIONAL MEDICINE UPDATE in Sandestin, FL. Contact The Deep South Center for Occupational Health & Safety; (205) 934-7178; dsc@uab.edu; www.uab.edu/dsc.



MYRTLE BEACH, SC

September 19-21

ASSE REGION VI PROFESSIONAL DEVELOPMENT CONFERENCE

This annual conference, now in its 21st year, features in-depth technical and management sessions on SH&E subjects designed to update attendees with cutting-edge knowledge. The conference will host noted speakers and presenters from across the country who will share a wealth of information and new ideas aimed at problem solving, safety improvement and accident prevention. Student activities and a golf tournament are also planned.

September 17-18

MANAGING SAFETY PERFORMANCE: SKILLS FOR SUPERVISORS & MANAGERS workshop in Houston, TX. Contact V. Scott Pignolet, Balmert Consulting; (281) 359-7234; www.balmert.com.

September 17-18

INTRODUCTION TO ACCIDENT INVESTIGATION course in Naperville, IL. Contact The National Safety Education Center; (800) 656-5317; www.earnyourcard.com.

September 17-19

MOBILE CRANE INSPECTOR TRAINING course in Tampa, FL. Contact Crane Tech; (800) 521-7669; www.cranetech.com.

September 17-19

■ **FRAME, TUBE & COUPLER SCAFFOLDING TRAINER** course in League City, TX. Contact Scaffold Training Institute; (800) 428-0162; info@scaffoldtraining.com; www.scaffoldtraining.com.

September 17-19

■ **ASP EXAM PREPARATION** workshop in Detroit, MI. Contact SPAN International Training; (888) 589-6757; www.spantrain.org.

September 17-21

FUNDAMENTALS OF LOSS CONTROL INSPECTION & REPORTING course in South Portland, ME. Contact Insurer's Loss Control Institute; (877) 846-7903 or (207) 846-7903; info@insurerslosscontrolinstitute.com; www.insurerslosscontrolinstitute.com.

September 17-21

COMPREHENSIVE INDUSTRIAL HYGIENE REVIEW course in Chapel Hill, NC. Contact North Carolina Occupational Safety & Health Education & Research Center; (888) 235-3320 or (919) 962-2101; osherc@unc.edu; <http://osherc.sph.unc.edu>.

September 17-21

COMPREHENSIVE INDUSTRIAL HYGIENE course in Ann Arbor, MI. Contact American Industrial Hygiene Association; (703) 849-8888; infonet@aiha.org; www.aiha.org.

September 17-21

LASER SAFETY OFFICER TRAINING WITH HAZARD ANALYSIS course in San Francisco. Contact Laser Institute of America; (800) 345-2737, ext. 21, or (407) 380-1553; www.laserinstitute.org.

September 18-19

LAB SAFETY course in Anchorage, AK. Contact Laboratory Safety Institute; (508) 647-1900; www.labsafety.org.

September 18-20

MACHINE SAFEGUARDING seminar in Rockford, IL. Contact Rockford Systems Inc.; (800) 922-7533; sales@rockfordsystems.com; www.rockfordsystems.com.

September 18-20

PRINCIPLES OF ERGONOMICS APPLIED TO WORK-RELATED MUSCULOSKELETAL NERVE DISORDERS course in Richmond, KY. Contact OSHA Training Institute Eastern Kentucky University Education Center; (859) 622-8405; www.ceo.eku.edu/osh.

September 18-21

A+A 2007: INTERNATIONAL TRADE FAIR FOR SAFETY, SECURITY & HEALTH AT WORK in Dusseldorf, Germany. Contact Messe Dusseldorf NA; (312) 781-5180; info@mdna.com; www.mdna.com.

September 18-21

MOBILE CRANE INSPECTOR TRAINING course in Woodland, WA. Contact Industrial Training International Inc.; (800) 727-6355; www.wtrc.com.

September 18-21

MODERN SAFETY MANAGEMENT course in San Diego, CA. Contact DNV Training; (800) 486-4524; www.dnvtraining.com.

September 19-21

ASSE REGION VI PROFESSIONAL DEVELOPMENT CONFERENCE in Myrtle Beach, SC. Contact Steve Lepock, ASSE Region VI; (757) 427-7280; www.asse-region6.org.

September 20-21

ARC-FLASH HAZARD ANALYSIS seminar in Lansing, IL. Contact AVO Training Institute; (877) 594-3456; www.avotraining.com.

September 20-21

MSHA NEW/INEXPERIENCED SURFACE MINER course in Phoenix, AZ. Contact ETC Compliance Solutions; (602) 923-9673; mail@e-t-c.com; www.e-t-c.com.

September 20-21

COMPLETE ENVIRONMENTAL REGULATIONS workshop in Little Rock, AR. Contact Lion Technology Inc.; (973) 383-0800; info@lion.com; www.lion.com.

September 21-23

CRSP EXAM PREPARATION workshop in Edmonton, Alberta. Contact Marie Quilley, Safety Results Ltd.; (780) 710-0247; mquilley@safetyresults.ca; www.safetyresults.ca.

September 24-26

RESCUE TECHNICIAN CERTIFICATION course in Baton Rouge, LA. Contact Roco Rescue; (800) 647-7626 or (225) 755-7626; www.rocorescue.com.

September 24-28

CONFINED SPACE RESCUE course in Carlin, NV. Contact University of Nevada, Reno Fire Science Academy; (800) 233-8928 or (775) 754-6003; www.fireacademy.unr.edu.

September 24-28

■ **CERTIFIED BEHAVIORAL-BASED ERGONOMIC SPECIALIST CREDENTIALING** course in Loveland, CO. Contact ISR Institute Inc.; (800) 414-2174 or (504) 733-2111; dr.bunch@isr-institute.com; www.isr-institute.com.

September 24-28

LIFE SAFETY CODE ESSENTIALS seminar in Charlotte, NC. Contact NFPA; (800) 344-3555 or (508) 895-8300; www.nfpa.org.

September 25

SAFETY & HEALTH TRAINING: WHAT'S NEW, WHAT WORKS, WHAT'S NEEDED? course in Tacoma, WA. Contact Northwest Center for Occupational Health & Safety; (800) 326-7568 or (206) 543-1069; ce@u.washington.edu; <http://nwcenter.washington.edu>.

September 25-27

■ **IMPLEMENTING CULTURE CHANGE** course. Contact Culture Change Consultants; (914) 834-7686; www.culturechange.com.

September 25-28

CIH & CSP MATH/SCIENCE review in Portland, ME. Contact Bowen EHS Inc.; (919) 647-4439; russ@bowenehs.com; www.bowenehs.com.

September 26

■ **INVESTIGATIVE PHOTOGRAPHY** audio-conference. Contact ASSE Customer Service Department; (847) 699-2929; customerservice@asse.org; www.asse.org.

October 1-2

ADVANCED HAZARDOUS WASTE MANAGEMENT course in Dallas, TX. Contact Lion Technology Inc.; (973) 383-0800; info@lion.com; www.lion.com.

October 1-4

GENERAL INDUSTRY STANDARDS course in Phoenix, AZ. Contact David Bellmont, ASSE Arizona Chapter; (602) 631-2004; dbellmont@scfaz.com; <http://az.asse.org>.

October 1-5

OSHA COMPLIANCE BOOTCAMP seminar in San Diego, CA. Contact ABS Consulting Training Solutions; (800) 769-1199; www.absconsulting.com/training/services.

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Asbestos Roadmap

ASSE recently commented on NIOSH's draft roadmap for scientific research in asbestos and other mineral fibers. Jeff Camplin, Administrator of ASSE's Environmental Practice Specialty, was the chief author of the comment, which was addressed to NIOSH Director John Howard and signed by 2006-07 ASSE President Don Jones. An edited version of the comment is printed here. Full text is available at www.asse.org/professionalaffairs/govtaffairs/gaupdate.

On behalf of the more than 30,000 members of ASSE and its Environmental Practice Specialty, ASSE offers the following comments on NIOSH's draft document, "Asbestos and Other Mineral Fibers: A Roadmap for Scientific Research," which was published as NIOSH Docket No. NIOSH-099 in February 2007.

The document suggests directions for new research to answer current scientific questions about occupational exposure and toxicity issues specifically relating to asbestos and other mineral fibers. ASSE believes that the benefits of the proposed research will clarify and reduce current scientific uncertainties in those areas, provide a sound scientific foundation for future policy development, and contribute valuable insight into the potential health impact from asbestos and other toxic and/or potentially toxic mineral fibers in our environment.

Although many advances were made in the scientific understanding of occupational health effects from asbestos and other mineral fibers in the mid- and late-20th century, new findings have generated many questions while significant areas of scientific uncertainty remain. ASSE finds that the research roadmap proposed by NIOSH accurately provides a current reappraisal of the areas of research needed to answer these new questions and to provide a sound scientific foundation for future policy development that would prevent asbestos-related occupational illnesses.

ASSE agrees with NIOSH that to reduce the uncertainty and controversy concerning exposure assessment and health effects of asbestos and other mineral fibers strategic research activities are needed in toxicology, epidemiology, exposure assessment and analytical methods. This important research is sorely overdue.

The Society also agrees that the scientific results can contribute to the potential development of new policies for asbestos and other toxic and/or potentially toxic mineral fibers with recommendations for exposure indices which more effectively protect workers' health. Likewise, ASSE sees a secondary benefit to this research that also will contribute toward better asbestos exposure assessments for family members of workers with occupational exposures to asbestos.

Finally, ASSE believes this research will benefit the understanding of health risks to the general public from two sources of low-level, sporadic and incidental exposures: 1) the mining, industrial and construction-generated environmental asbestos pollution, and 2) naturally occurring, fibrous amphibole and zeolite minerals. In short, ASSE supports the NIOSH roadmap and the agency's research efforts to bridge the knowledge gaps and reduce the uncertainty regarding the occupational exposures to asbestos and these other probable toxic and/or potentially toxic mineral fibers.

NIOSH has requested public comment on the potential research goals and objectives suggested by the draft document. ASSE provides the follow-

ing comments in support of the three main topic areas the roadmap proposes.

Sampling & Analytical Methods

The NIOSH roadmap identifies the major known areas of uncertainty about the toxicities of fibers from the asbestos minerals, of fiber-like cleavage fragments from nonasbestiform analogs of the asbestos minerals and of other mineral fibers, as well as the shortcomings of current analytical techniques. ASSE is concerned that these scientific uncertainties have negative effects on the health of workers exposed to asbestos. ASSE supports the NIOSH research proposal found in Section 2 of the roadmap that addresses these gaps in sampling and analytical methods for asbestos and other mineral fibers. ASSE encourages NIOSH to expand this research to include man-made fibers.

Important Determinants of Toxicity

ASSE is concerned that fiber shape might be more important than chemical composition in explaining the health effects of asbestos. If true, this finding would expand ASSE's support of the NIOSH roadmap with its probable effects on research in occupational exposures to man-made and other naturally occurring mineral fibers. This includes 1) naturally occurring fibrous minerals found as a contaminant in certain mined commodities (e.g., richterite and winchite in vermiculite); 2) man-made fibers (e.g., synthetic vitreous fibers); and 3) new or emerging man-made fiber technologies (e.g., carbon nanotubes).

ASSE agrees that the biological significance of occupational exposure to many of these minerals remains unknown and difficult to establish given the mixed and sporadic nature of exposure in many work environments, and the general lack of good exposure characterization information. ASSE finds that the roadmap provides research which will provide a better understanding of the significance of these complex exposures on the workforce.

ASSE also supports the ultimate goal of developing a comprehensive research program for asbestos and other mineral fibers that would entail the development of a unified theory of toxicity for thoracic-size mineral fibers. The Society agrees that a unified approach would specify criteria, such as a range of chemical composition, dimensional attributes (e.g., length range, diameter range, aspect ratio) and dissolution rate/fragility (biopersistence) for considering fibers as potentially toxic. Such an approach would have the advantage of identifying asbestos and other fibers warranting concern based on their qualities and attributes. Even new fibers identified or manufactured could be compared to the criteria to determine the likelihood of health effects.

A unified theory of fiber toxicity would clearly identify the potency of fibers for causing specific diseases and how that potency varies, depending on the particular combination of fiber characteris-

tics and dose. ASSE has concluded that a unified, coherent risk management approach for fibers that fully incorporates this understanding of the toxicity of fibers must be developed to minimize the potential for disease.

The policy concerning thoracic-size fibers could be extended beyond mineral fibers to synthetic vitreous fibers and even to other manufactured materials. ASSE is specifically interested in any research of occupational exposure to the emergence of engineered nanomaterials in the workplace. Although engineered nanomaterials are well beyond the scope of the NIOSH roadmap, ASSE is concerned that fiber-shaped nanoscale particles have been shown to affect health in some animal studies. ASSE supports the NIOSH suggestion to integrate the results of nanoparticle toxicity investigations into the NIOSH roadmap. Such integration will help advance the development of a unified theory of fiber toxicity.

Occupational Exposures & Their Health Outcomes

ASSE recognizes that the importation and use of asbestos-containing materials in the U.S. has steadily declined over the past 30 years. The NIOSH roadmap provides additional evidence that occupational exposures in traditional asbestos occupations also have declined during this time.

However, ASSE supports NIOSH's position that current exposure limits to occupational exposure to asbestos are based more on limits of sensitivity of analytical protocols than on health risks. The Society also finds that asbestos use has not been completely eliminated and that asbestos-containing materials remain in place in structural materials and machinery. Hazardous exposures remain a potential occupational risk. Therefore, these lower-level asbestos exposures incurred in the workplace must continue to be studied.

ASSE is also concerned that occupational exposures to naturally occurring asbestos, other fibrous minerals and man-made fibers have occurred and will continue to occur. The current definition of asbestos is restricted to the six commercially important asbestos minerals. This definition does not provide occupational protection from exposure to fibers from other fibrous silicate minerals with structures and chemical compositions similar to fibers from asbestos minerals or man-made fibers that have either demonstrated health effects in exposed workers or can reasonably be predicted to produce health effects. ASSE supports the roadmap research into these relatively new occupational exposure routes.

Conclusion

ASSE fully supports the proposed research goals found in the NIOSH roadmap. Each is an important step toward protecting workers from asbestos, other fibrous minerals and man-made fibers.

To achieve these goals, a significant investment of time, scientific talent and resources by NIOSH and its partners will be necessary, as will coordination between these efforts and other ongoing research. Investment in this research will benefit worker safety and

health, provide knowledge needed to protect the general population and offer important insight into the emerging presence of engineered nanomaterials in the workplace.

Any recommendations for occupational safety and health protection policies must be based on sound scientific research. The NIOSH roadmap provides a comprehensive research agenda for achieving sound policy on addressing the risks posed by asbestos, other toxic and/or potentially toxic mineral fibers, and man-made fibers.

The logo for the Executive Program in Safety Management. It features the text "the EXECUTIVE PROGRAM" in a large, bold, serif font, with "EXECUTIVE" in red and "PROGRAM" in white. Below this, the text "in Safety Management" is written in a smaller, red, cursive font. To the right of the text is the ASSE logo, which consists of a shield containing the letters "ASSE". Below the shield is the text "American Society of Safety Engineers".

A vertical graphic with a dark, textured background. The text "Your Next Step in Continuing Education" is written in a white, serif font, with "Your Next" and "Step in" on the first line, "Continuing" on the second line, and "Education" on the third line.

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REQUIRED SEMINAR SCHEDULE

October 22-25, 2007
Orlando, FL

February 18-21, 2008
Savannah, GA

May 12-16, 2008
Washington, DC

Hotlinks

ASSE

American Society of Safety Engineers
www.asse.org

CSB

Chemical Safety & Hazard Investigation Board
www.csb.gov

DOE

Dept. of Energy
www.doe.gov

DOL

Dept. of Labor
www.dol.gov

DOT

Dept. of Transportation
www.dot.gov

EPA

Environmental Protection Agency
www.epa.gov

HHS

Dept. of Health & Human Services
www.dhhs.gov

MSHA

Mine Safety & Health Administration
www.msha.gov

NIOSH

National Institute for Occupational Safety & Health
www.cdc.gov/niosh

NRC

Nuclear Regulatory Commission
www.nrc.gov

NTSB

National Transportation Safety Board
www.nts.gov

OSHA

Occupational Safety & Health Administration
www.osha.gov

OSHA INTERPRETATION

OSHA Defines "On Site in One Location" for PSM Standard

At the request of the Occupational Safety and Health Review Commission, OSHA has clarified the phrase *on site in one location* in the application section of its Process Safety Management (PSM) of Highly Hazardous Chemicals standard. The agency interprets the phrase to mean that the standard applies when a threshold quantity of a highly hazardous chemical (HHC) exists within an area under the control of an employer or group of affiliated employers. It also applies to any group of vessels that are interconnected, or to separate vessels that are close enough in proximity that the HHC could be involved in a potential catastrophic release. The interpretation was published in the June 7, 2007, *Federal Register*.

MINING SAFETY

MSHA Extends Comment Period for ETS

MSHA has extended the comment period to Aug. 17 for the Emergency Temporary Standard (ETS) on sealing of abandoned areas of underground coal mines, which was published in the May 22, 2007, *Federal Register*. MSHA will accept written comments and other appropriate data for the record from any interested party up to the close of the comment period.

AIR QUALITY

EPA Proposes Stronger Ground-Level Ozone Standards

Based on recent scientific evidence about ozone health effects, EPA is proposing revisions to air quality standards for ground-level ozone. The proposal recommends an ozone standard within a range of 0.070 to 0.075 ppm. EPA also is taking comments on alternative standards within a range from 0.060 ppm up to the level of the current 8-hour ozone standard, which is 0.08 ppm.

Ozone can harm people's lungs, and exposure can aggravate asthma and increase susceptibility to respiratory infections. Ground-level ozone is not emitted directly into the air, but is created through a reaction of nitrogen oxides and volatile organic compound emissions in the presence of sunlight. Primary man-made sources of these emissions are industrial facilities, electric utilities, motor vehicle exhaust, gasoline vapors and chemical solvents.

The agency will take public comment for 90 days following publication of the proposal in the *Federal Register*. EPA will hold public hearings in Los Angeles and Philadelphia on Aug. 30, and in Chicago and Houston, TX, on Sept. 5. For more information about the proposed standard, visit <http://epa.gov/groundlevelozone>.

SAFETY BULLETIN

CSB Issues Safety Bulletin on Chlorine Release During Railcar Unloading

U.S. Chemical Safety and Hazard Investigation Board (CSB) recently released a safety bulletin warning that some chlorine railcar transfer systems lack effective detection and emergency shutdown devices, allowing for possible large-scale toxic releases.

According to CSB, the excess flow valves (EFVs) on chlorine railcars are designed to stop the flow of chlorine if an external valve breaks off while the car is in motion—they are not designed to stop leaks during unloading, and may not be activated by a transfer hose failure. The bulletin cites two incidents of accidental chlorine release that occurred as a result of ruptured transfer hoses.

The bulletin recommends that companies install emergency shutdown systems which can quickly stop the flow of chlorine if a hose ruptures during the unloading operation. Furthermore, the agency calls on Department of Transportation (DOT) to require affected facilities to install remotely operated emergency

ASSE Supports Diacetyl Legislation

In a recent letter to Rep. Lynn Woolsey (D-CA), chair of the Committee on Education and Labor's Subcommittee on Workforce Protections, ASSE expressed its support for legislation to protect workers at food processing plants from exposure to diacetyl, a chemical used in artificial food flavoring.

"We applaud you for your leadership in addressing quickly the risks posed to workers from the chemical diacetyl used in microwave popcorn and a wide range of other food preparation processes," says 2006-07 ASSE President Donald S. Jones, P.E., CSP, in the letter.

Diacetyl is commonly used in the artificial butter flavoring in microwave popcorn, which, according to NIOSH, may be hazardous when heated and inhaled over a long period. Workers in several factories that manufacture artificial butter flavoring have been diagnosed with bronchiolitis obliterans, also known as "popcorn lung." This disease has led to dozens of illnesses and several deaths.

Acknowledging the gap in knowledge on this issue, Jones continues, "ASSE would encourage you and the subcommittee to consider amendments to this bill or separate legislation that would require OSHA to establish a negotiated rulemaking process that could give all stakeholders the opportunity to expand knowledge and understanding of exposure limits beyond 46 flavorings. For these and other chemicals, negotiated rulemaking would give OSHA a much better chance of achieving exposure limits that would help avoid the unfortunate litigation that has impeded OSHA's efforts to update existing PELs."

To view the entire letter, visit www.asse.org/professionalaaffairs under "Latest Federal Communications."

isolation devices, which can quickly shut down the flow of chlorine in the event of a hose rupture or other equipment failure. Specifically, CSB recommends DOT require the following safeguards:

- remotely operated isolation devices that will quickly isolate a leak in any of the flexible hoses used to unload a chlorine car;
- the shutdown system must be capable of stopping a chlorine release from both the railcar and the equipment at the facility receiving the chlorine;
- periodic maintenance and operational testing of the emergency isolation system to ensure it will function in the event of an unloading system chlorine leak.

To view the bulletin, visit www.csb.gov/safety_publications/docs/CSB_ChlorineShutdownBulletin.pdf.

AIR QUALITY

Proposed EPA Guidelines Focus on Clean, Energy-Efficient Vehicles

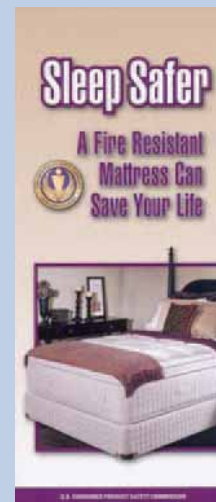
EPA is proposing criteria for certifying vehicles as clean and energy efficient in order to guide states that choose to allow such vehicles in high occupancy vehicle (HOV) lanes—even when the vehicles have only one occupant. The proposal is designed to spur the purchase and use of vehicles that are less

PRODUCT SAFETY

New CPSC Flammability Standard for Mattresses Takes Effect

A new mandatory standard from Consumer Product Safety Commission (CPSC) is designed to reduce the severity of mattress fires ignited by open flame sources such as candles, matches and lighters. The standard affects mattresses manufactured in or imported into the U.S. on or after July 1, 2007, and is expected to prevent as many as 270 deaths and 1,330 injuries each year.

CPSC urges consumers shopping for a new mattress to look for a label on the mattress stating that it meets the federal flammability requirement, known as 16 CFR Part 1633. In addition, the agency warns consumers that increased fire resistance does not eliminate the fire risk, and that they should continue to follow fire safety practices. CPSC's publication, "Sleep Safer: A Fire Resistant Mattress Can Save Your Life," is designed to provide consumers with information on the standard along with fire safety tips. To request a copy of the brochure, send an e-mail to info@cpsc.gov or call (800) 638-2772.



harmful to the environment and better for energy security.

The proposal applies to cars, SUVs, vans and trucks below 8,500 lb. To be eligible for the HOV exemption, these vehicles would have to meet specifications for both low emissions and energy-efficiency.

To be considered low emission, EPA proposes that a vehicle would have to be

certified to either the stringent federal Tier 2 bin 5 standard (or cleaner) or the equally stringent California LEV II standards.

To be considered energy efficient, EPA proposes that a vehicle would have to be: 1) a dedicated alternative fuel vehicle or 2) a hybrid vehicle achieving 50% or better in-city fuel economy or 25% or

Rules & Regs continued on page 16

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Detroit MI Sept 17-19, 2007
Houston TX Oct 22-24, 2007
Las Vegas NV Nov 5-7, 2007

CSP (Comprehensive Practices)

Reno NV Aug 23-25, 2007
Detroit MI Sept 20-22, 2007
Houston TX Oct 25-27, 2007
Las Vegas NV Nov 8-10, 2007

OHST/CHST

Las Vegas NV Jul 30-Aug 1/ Aug 2-4, 2007

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better in combined city/highway fuel economy compared to a similar gasoline fueled vehicle.

For more information on EPA's proposal www.epa.gov/otaq/ld-hwy.htm.

GREEN BUILDING

EPA Joins with Mexico & Canada to Promote Green Building

EPA Administrator Stephen Johnson joined environmental officials from Mexico and Canada to launch collaborative environmental initiatives on green building and tracking pollution in North America. Johnson, along with host Juan Rafael Elvira Quesada, Mexican Secretary of Environment and Natural Resources, and John Baird, Canadian Environment Minister, gathered in Morelia, Mexico, for the 14th Council Session of the Commission for Environmental Cooperation

(CEC), an organization created by the three nations to address regional environmental concerns.

The council agreed that CEC should lead initiatives to promote green building throughout the continent, and should help foster greater cooperation on air quality in North America. For more information, visit www.cec.org.

TRANSPORTATION SAFETY

DOT Details Cross-Border Trucking Safety Standards

In a supplemental *Federal Register* notice published June 8, 2007, Department of Transportation (DOT) published additional details about the rigorous safety standards and inspection program in place for its cross-border trucking demonstration program. The notice includes comprehensive information about the program, including preauthorization safety audits of Mexican trucking companies, which are conducted by U.S. auditors in Mexico.

It also details specific measures already in place to protect public safety and health—including roadside inspections, safety ratings, compliance reviews and civil penalties—as well as English

language proficiency requirements and a review of U.S. motor carrier safety laws and corresponding Mexican regulations.

PROPOSED RULEMAKING

OSHA Proposes Power Press Safety Rule

OSHA has published an advance notice of proposed rulemaking on mechanical power press safety, seeking comment on its project to update the general industry mechanical power press standard. The existing standard is based on ANSI's 1971 standard, which has been updated several times. OSHA seeks to update the rule to be consistent with the 2001 edition of the ANSI standard. For more information, visit www.osha.gov.

AIR EMISSIONS

EPA Issues Final Rule on Auto Surface Coatings

EPA has taken direct final action on amendments to the National Emission Standards for Hazardous Air Pollutants (NESHAP): Surface Coating of Automobiles and Light-Duty Trucks. The final rule clarifies the interaction between the automobiles and light-duty trucks

WORKSITE SAFETY

CSB Issues Safety Advisory on Chemical Oxygen Generators

U.S. Chemical Safety and Hazard Investigation Board (CSB) has issued a safety advisory concerning the dangers of transporting and handling unspent aircraft chemical oxygen generators. The agency found that the devices most likely contributed to the rapid spread of a fire at the EQ Industrial Services (EQ) hazardous waste facility in Apex, NC, in October 2006. The fire destroyed the facility's hazardous waste building.

"Our investigation found that the unspent oxygen generators were stored in the area where the fire is believed to have originated," says lead investigator Robert Hall, P.E. "The generators can be activated by heat, which results in the release of oxygen, further accelerating and intensifying the fire. When firefighters first arrived, the fire was small. But it quickly spread to an adjacent bay."

Chemical oxygen generators, used in commercial aircraft to supply oxygen to passengers in drop-down masks in the event of cabin depressurization, are similar to those that started a fire in the cargo compartment of a ValuJet airplane that crashed in Florida in 1996. National Transportation Safety Board's (NTSB) report of that accident stated that expired but fully functioning chemical oxygen generators should be expended before being transported.



Unspent aircraft chemical oxygen generators were responsible for destroying EQ's hazardous waste building in Apex, NC.

CSB notes several factors that contributed to the EQ fire: The generators were past their projected service life but remained fully charged and hazardous; the contents were not expended prior to transport; and shipping documents did not identify them as unspent chemical oxygen generators, as required by DOT regulations.

CSB's safety advisory alerts aircraft maintenance and hazardous waste facility personnel to the hazards associated with transporting and storing expired but unspent aircraft oxygen generators. For more information, visit www.csb.gov.

NESHAP and the NESHAP for surface coating of plastic parts and products. EPA also amended the plastic parts NESHAP to clarify that screen printing is not subject to the rule. The direct final rule took effect June 25, 2007.

AGENCY RESOURCES

OSHA Publishes

QuickCard on CO Hazards

OSHA recently published a new QuickCard on carbon monoxide (CO) poisoning. Available on the agency's website in both English and Spanish, the card describes common sources, symptoms and effects of carbon monoxide exposure, along with a list of preventive measures employees can take to protect themselves from CO hazards. The card may be downloaded from www.osha.gov/OshDoc/quickcards.html or can be ordered from OSHA's publications office, (202) 693-1888.

LEAD PAINT

EPA Proposes Additional Coverage in Lead Paint Requirements

EPA is proposing that contractors and construction professionals performing renovation in child-occupied facilities which contain lead-based paint follow lead-safe work practices, and have accredited training and certification. This proposed requirement supplements the original proposal issued Jan. 10, 2006, which applied to renovations in most housing built before 1978.

The proposal defines a child-occupied facility in terms of the number of hours a child under age 6 spends there on a regular basis. Child-occupied facilities may be located in housing or in public or commercial buildings. They include child care centers, preschools and kindergarten classrooms. According to EPA, the supplemental proposed requirement may affect 916,000 children under age 6 annually. For more information, visit www.epa.gov/lead/pubs/renovation.htm.

CONSTRUCTION SAFETY

OSHA to Implement New Portland Cement Inspection Procedures

OSHA has agreed to settle a challenge to the agency's hexavalent chromium standard. The agreement involves the Building Construction Trades Department, AFL-CIO, Laborers' International Union of North America and International Brotherhood of Teamsters. Under terms of the settlement, the agency will issue a new document that provides specific enforcement procedures for

compliance officers to follow at all construction sites where employees are working with Portland cement. The document, "Portland Cement Inspection Procedures," will explain how existing OSHA standards and requirements (air contaminants, PPE, sanitation, hazard communication and recordkeeping) apply to operations involving Portland cement and will list all applicable provisions on a single inspection checklist.

PROPOSED RULEMAKING

PHMSA Seeks to Revise HazMat Regulations

Pipeline and Hazardous Materials Safety Administration (PHMSA) has issued a notice of proposed rulemaking to amend the Hazardous Materials Regulations to clarify requirements governing emergency response information services provided by arrangement with hazardous materials offerors. To preserve the effectiveness of these arrangements for providing accurate and timely emergency response information, PHMSA proposes to require that basic identifying information (offeror name or contract number) be included in shipping papers. This information will enable the service provider to identify the shipper on whose behalf it is accepting responsibility for providing emergency response information in the event of a hazardous materials incident.

Comments must be received by Aug. 31, 2007, and may be submitted via the Federal Rulemaking Portal at www.regulations.gov or the DOT electronic docket site, <http://dms.dot.gov>. Comments also may be sent by fax: (202) 493-2251; or mail: Docket Management System, U.S. Department of Transportation, Dockets Operations, M-30, Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590-0001. Comments should include docket number PHMSA-06-26322 (HM-206F).

WORKPLACE HAZARDS

OSHA NEP to Address Hazardous Chemicals in Petrochem Industry

OSHA has implemented a National Emphasis Program (NEP) to help eliminate workplace hazards associated with the release of highly hazardous chemicals at petroleum refineries. Under the program, OSHA will conduct 81 inspections over the next 2 years. The NEP will provide guidance to OSHA national, regional and area offices as well as states that choose to implement similar programs. For more information, visit www.osha.gov/OshDoc/Directive.pdf/CPL_03-00-004.pdf.

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SAFETY TRAINING

Safety Center Built to Prevent Work-Related Injuries

Reller Risk Management (RRM), a risk management firm, has developed the RRM Safety Center in

East Syracuse, NY. Charles Reller, RRM founder, and Associated Builders and Contractors Compensation Trust, a workers' compensation trust administered by RRM, created the center to educate industry workers on the importance of workplace safety and to help reduce work-related injuries. The center offers various learning techniques including classroom settings as well as more hands-on activities. A new course, Green Building Construction Practice, teaches building owners the most efficient green construction practices and discusses the LEED rating system. Other courses include Emergency Evacuation and Fire Prevention, Confined Space Rescue and Crane Safety Training. For more information, contact Eileen Clinton at eclinton@bbempirestate.com.



RRM Safety Center educates industry workers on the importance of safety to help reduce the incident of work-related injuries.

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PROGRAM DEVELOPMENT

OSHA Forms Directorate to Increase Program Effectiveness

To increase the effectiveness of its training and compliance assistance programs, OSHA has created a directorate of training and education. The new addition will provide strong leadership, direction and management of the OSHA Training Institute (OTI), OTI Education Center Program, Outreach Training Program and other compliance assistance and training programs. In addition, OSHA hopes to improve the quality of its training, and increase the number of course offerings and use of training technologies. For more information, visit www.osha.gov.

CALL FOR PAPERS

Conference on Occupational Stress & Health Seeks Papers

Proposal deadline for posters, papers and symposia for the 7th Annual International Conference on Occupational Stress and Health is Aug. 31, 2007. The conference, titled "Work, Stress and Health," will be held March 6-8, 2008, at the Omni Shoreham Hotel, Washington, DC, with continuing education workshops on March 5. It will focus on the translation of research to practice, covering topics such as work and family issues, workplace violence, long work hours, best practices for pre-venting stress and the aging workforce.

Panel discussions, expert presenters and informal meetings with leading scientists and practitioners will provide a forum to address the ever-

changing nature of work in the industry. Of particular interest are submissions about prevention/intervention programs and workplace policies, practices and other safety and health initiatives that illustrate the translation of research to practice.

Proposals, papers and symposia may be submitted online at www.apa.org/pi/work/wsh.html or may be mailed to Wesley Baker, conference coordinator, American Psychological Association, 750 First St. NE, Washington, DC 20002-4242. For more information, visit www.apa.org/pi/work/wsh.html or send an e-mail to WSHConference@apa.org.

SAFETY PARTICIPATION

New Program Uses Team Sports to Improve Safety Programs

F1rst League LLC (1L), a service application program, uses sports to promote employee engagement in safety programs and other business priorities. The program creates "fantasy" sports leagues for companies where the employee teams score points by performing certain safety-related activities and tasks. Companies determine their own unique business objectives for the game, such as reducing in-process errors or improving overall product quality. These goals become the basis of the scoring sheet. Teams are set up with "coaches" who receive simple web-based training for using the online program.

Two certified safety professionals, Dan Eggleston and Michael Svac, created 1L and its slogan, "Play That Works," which builds on the energy and excitement that sports-related activities can create. After Noramco Inc. (Johnson & Johnson) participated in the Safety F1rst League, the company saw a 100% improvement in near-hit reporting with more than 90% participation. The results prompted the company to invite 1L to the national VPPPA conference to share the experience with others. The conference will be held in Washington, DC, Aug. 27-30, 2007. To learn more about 1L, visit www.f1rstleague.com.

EMERGENCY PREPAREDNESS

ACHMM Conference Holds HazMat Emergency Drill

In a live emergency response simulation, participants of the Academy of Certified Hazardous Materials Managers (ACHMM) conference will have the opportunity to learn how to respond to a hazardous materials spill. The hands-on training drill will be held aboard a Washington, DC, Metrorail system subway car. The 2-hour drill will involve the release of a chemical in a rail car and the rescue of victims by fire and HazMat teams. Participants will observe the HazMat team response, including detection, monitoring, decontamination and rescue.

The exercise will take place Aug. 13 at the Washington Metropolitan Area Transportation Authority's (WMATA) training center in Landover, MD. It will be presented by WMATA trainers and

HazMat teams from Arlington Fire Department, Alexandria Fire Department and the Pentagon. According to ACHMM, the emergency response exercise portion of the ACHMM annual conference is anticipated by more than 1,000 environmental, health, security and safety professionals throughout the country. This year's conference is slated to run Aug. 12-15 in Arlington, VA. To learn more about the conference, visit www.achmm.org. For more information on emergency preparedness practices, turn to the Best Practices article on p. 48.

ERGONOMICS AWARD

Shiftwork Research Wins Liberty Mutual Prize

The scientific paper, "Shiftwork Experience, Age and Cognitive Performance," which appeared in *Ergonomics*, Vol. 48, No. 10, received the 2007 Liberty Mutual Award for its examination of the long-term consequences of sleep deprivation, especially the influence shiftwork has on verbal memory and sleep patterns. In the study, participants completed a questionnaire on working hours, shiftwork and sleep patterns. Researchers also examined participants' cognitive abilities through neuropsychological tests.

Results showed that workers currently employed as shiftworkers responded with lower cognitive performance than those who were not shiftworkers. A decrease in memory performance with an increase in shift-work duration was observed. Also, workers who stopped shiftwork more than 4 years prior displayed an increase in cognitive perform-

ance, suggesting a possible reverse of effects.

The Liberty Mutual Research Institute for Safety and the Ergonomics Society established the Liberty Mutual Award to promote excellence in safety and health research. The award recognizes the paper that best adds to the advancement of the practice of ergonomics. To learn more, visit www.libertymutual.com or www.ergonomics.org.uk.

CONSTRUCTION SAFETY

Bob Moore Construction Stands Down for Safety

In the largest construction safety stand down in Texas history, Bob Moore Construction, a Texas-based commercial construction company and general contractor, took part in the SAFE Stand Down, organized by the Associated General Contractors of America. The 90-minute event began when 306 general contractors across the state stopped production so an estimated 5,200 workers could receive safety awareness and procedure training. AGC reports more than \$2.1 billion in construction projects was stopped. The theme, "Take Five to Stay Alive," promoted pre-task planning to reduce accidents and improve safety. Training for this year's event focused on how to use checklists and job hazard analyses to plan ahead and engineer tasks. Reportedly, the stand downs have been successful in reducing jobsite accidents—the north Texas region has seen jobsite facility accidents decrease more than 50% between 2004 and 2006.

The north Texas region has seen jobsite facility accidents decrease more than 50% between 2004 and 2006.

Industry Notes continued on page 20

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SAFETY MILESTONE

Yoh Achieves 72 Million Safe Work Hours During National Safety Month

Yoh, a provider of temporary and direct placement of technology and professional personnel for various industries including engineering, healthcare and industrial, has reached 7 years and 72 million hours without a day away from work due to work-related or personal injuries. Through its Why Be Safe program, Yoh reinforces its commitment to protecting the health and well-being of its employees. Logging in its record during National Safety Month, the firm promotes safety awareness by providing employees with a safety orientation, a library of safety tips, and procedures to create and maintain a safety-conscious environment.

"National Safety Month is the perfect opportunity to remind our staff and talent pool to take a few minutes each day to recall the safety training and guidance they have received from Yoh, and remember why it's important to practice safe behaviors in everything they do," says CEO Bill Yoh. The company has posted information on various work- and home-related hazards and preventive measures at www.whybesafe.com. To learn more about Yoh, visit www.yoh.com.

FIRE SAFETY

NFPA Announces Theme for Fire Prevention Week 2007

The National Fire Protection Association (NFPA) announced the theme for Fire Prevention Week 2007. "It's Fire Prevention Week—Practice Your Escape Plan" is scheduled for Oct. 7-13, 2007, and focuses on how to practice and plan escape from a home if a fire occurs.

NFPA encourages families to not only create their escape plan, but practice it as well. The public can visit NFPA's website at www.nfpa.org to sign up for "The Great American Fire Drill" where after you practice your escape plan, you can sign up and be added to the list of people who have participated. In addition to being prepared to escape a fire, NFPA suggests taking steps to prevent fires before they happen. People can avoid fires by making sure their homes are as safe as possible, since the leading causes

of some home fires are cooking, smoking, heating, electrical equipment and intentional reasons.

FUTURE ENGINEERS

New Message Aims to Attract Students to Engineering

Junior Engineering and Technology Society (JETS) has implemented a new three-part campaign—Explore, Assess and Experience Engineering—as a way to foster a new level of excitement for the profession. "Explore" will include feature video clips, interviews with engineers and content covering more than 20 areas, as well as an online newsletter, *JETS Pre-Engineering Times*. "Assess" will focus on thinking visually and analytically, steering away from the stereotype that only the best in math and science can be engineers. The third element, "Experience," focuses on the annual TEAMS competition, a program that challenges students to solve 80 problems



in 90 minutes. The program will steer away from abstract problems and focus more on practical applications. This element will also push for participation in the National Engineering Design Competition. With this new message, JETS hopes to attract new students who may have not been interested in engineering in the past. To learn more about JETS, visit www.jets.org.

INDUSTRY AWARD

Humantech Receives Alfred P. Sloan Award for Business Excellence

Humantech Inc., a human performance consulting firm specializing in workplace ergonomics, was recently awarded the Alfred P. Sloan Award for Business Excellence in Workplace Flexibility. The award is part of the "When Work Works" project, a continuous initiative of the Families and Work

Institute, the Institute for a Competitive Workforce and the Twiga Foundation. The project provides research and resources, then shares results on how to create flexible and effective work environments.

Humantech was recognized for its workplace environment that resembled "an array of work options to reflect different job responsibilities and life situations, as well as the needs of the business." Flexible work practices at Humantech are used to create and sustain a supportive workplace that implements employee-friendly programs.

Candidates for the award were evaluated on a two-step process that involved a comparison of the employer's application data to nationally representative data from Families and Work Institute's National Study of Employers, then validating what employers report against employee responses. "This award is one of the most rigorous in the country," said Ellen Galinsky, president of Families and Work Institute. "These businesses understand that workplace effectiveness and flexibility are part of being an employer of choice today. They are truly models for other companies." To learn more about Humantech, visit www.humantech.com.

PROFESSIONAL DEVELOPMENT

Young Engineers Selected for NAE Symposium

Eighty-three young engineers from industry, academia and government have been nominated by fellow engineers or organizations to take part in the National Academy of Engineering's (NAE) 13th Annual U.S. Frontiers of Engineering Symposium. The event, to be held Sept. 24-26 at Microsoft Research in Redmond, WA, will host engineers ages 30 to 45 who are performing exceptional engineering research and technical work in many disciplines. The symposium will cover topics such as trustworthy computer systems, safe water technologies, modeling and simulating human behavior, biotechnology for fuels and chemicals, and the control of protein conformations.

"[The symposium] is a proven mechanism for traversing engineering disciplines. By exposing bright young minds to developments in areas other than their own—and giving them lots of time to interact—Frontiers enables advances in approaches and thinking that would

not have occurred otherwise," says NAE President William Wulf. To learn more about NAE or to see a list of the engineers, visit www.nae.edu.

TRANSPORTATION SAFETY

IWSA & OSHA Support Hauler Safety Month

Integrated Waste Services Association (IWSA) and OSHA teamed up in June to support National Hauler Safety Month, which represents those who transport waste and hazardous materials, a job that can be dangerous without the proper safety precautions. OSHA Administrator Edwin Foulke Jr., says that the month focuses on addressing the hazards by teaching waste haulers, operators, owners and employees the best methods for safety and health. IWSA member facilities, as well as several OSHA offices, also hosted Hauler Safety Days throughout the month to help reiterate the message to workers that safety is an important and necessary part of their work.

TRAFFIC SAFETY

Traffic Deaths Down, Still Too Many Lives Lost

Although preliminary data reports a slight decline in nationwide highway traffic deaths, Transportation Secretary

Mary Peters cautions that far too many lives are still lost due to highway accidents. Figures from 2006 show a fatality rate of 1.44 deaths per 100 million vehicle-miles traveled. This is down from the 2005 figure of 1.45. Also, injuries dropped 6% from 2.7 million to 2.54 million. Peters reminds drivers that during the summer driving season, police officers will be patrolling for people who are not buckled up.

"Bad things happen when people don't buckle up, and no one is immune to the damage and devastation that comes from not wearing a seat belt," says Peters. Preliminary figures from 2005-06 also show: overall alcohol-related fatalities increased from 17,525 to 17,941; pedestrian deaths dropped from 4,881 to 4,768; and fatalities from large truck crashes dropped from 5,212 to 5,018.

CONSUMER AWARENESS

Calculate Your Energy Use on EPA Website

EPA's Power Profiler, located at www.epa.gov/cleanenergy/powerprofiler, calculates how much air pollution results from individual electricity use, the fuel mix used to produce it and how to reduce the impact it causes on the environment. Users can discover how their energy use affects the Earth and

can assess their annual emissions from the calculator on their monthly electricity use. The site also guides consumers to other information on how to reduce their emissions through energy efficiency and use of renewable energy. In addition to their individual use, consumers can compare their total to national averages.

The air pollutants used in the calculator are carbon dioxide—which contributes to global warming or climate change—and sulfur dioxide and nitrogen oxides, which contribute to unhealthy air quality and acid rain.

LASER SAFETY

BLS Creates Online Forum for Laser Safety

The Board of Laser Safety (BLS) has created a new online forum to provide opportunities for the education, assessment and recognition of laser safety professionals. The *Laser Safety Forum* promotes the improvement of laser safety practices by providing a place to share information, concerns and new ideas related to the industry. Users can access the forum at www.lasersafety.org/forum and register to receive e-mail updates on postings about the most recent information. For more information, contact BLS at bls@lasersafety.org.

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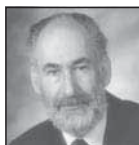
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ASTM Proposes New Standard Practice

ASTM International has proposed the new Standard Practice for Specimen Preparation and Mounting of Reflective Insulation and Sheet Radiant Barriers for Building Application to Assess Surface Burning Characteristics (BSR/ASTM Z3581Z/WK13727-200x) to create a mounting method for reflective insulation in the ASTM E84 fire test. This practice describes a procedure for specimen preparation and mounting when testing reflective insulation and sheet radiant barriers to assess flame spread and smoke development as surface burning characteristics using Test Method E84. (Adapted from *ANSI Standards Action*, Vol. 38, No. 16.)

New AIHA Standards Now Available

American Industrial Hygiene Association's (AIHA) new standard, Portable Ventilation Systems (BSR/AIHA Z9.9-200x), is now available. This standard discusses portable ventilation equipment and systems used for the reduction, control or prevention of exposure to hazardous atmospheres or to airborne substances in the occupational environment and for provision of comfort to employees.

AIHA's new standard, Fundamentals Governing the Design and Operation of Dilution Ventilation Systems in Industrial Occupancies (BSR/AIHA Z9.10-200x), is now available. This standard establishes minimum requirements for the commissioning, design, specification, construction, installation, management, operation, maintenance and testing of dilution ventilation systems (including demand dilution ventilation) used for the reduction, prevention and control of employee exposure to harmful airborne substances in the industrial environment. The standard establishes minimum requirements to provide safe and healthy working conditions in industrial employee occupancies.

Adoption of NEMA Standards Proposed

National Electrical Manufacturers Association (NEMA) has proposed the adoption of the standard, Arc Welding Equipment—Part 2: Liquid Cooling Systems (BSR/IEC 60974-2-200x). This standard provides safety and construction requirements for liquid cooling systems, internal or external to arc welding/cutting power sources, intended to cool torches.

NEMA has proposed the adoption of the standard, Arc Welding Equipment—Part 3: Arc Striking and Stabilizing Devices (BSR/IEC 60974-3-200x). This standard provides safety requirements for arc striking and stabilizing devices, internal or external to a power source, for arc welding and allied processes.

NEMA has proposed the adoption of the standard, Arc Welding Equipment—Part 5: Wire Feeders (BSR/IEC 60974-5-200x). This standard provides safety and performance requirements for industrial and professional equipment used to feed filler wire in arc welding and allied processes.

NEMA has proposed the adoption of the standard, Arc Welding Equipment—Part 6: Limited-Duty Power Sources (BSR/IEC 60974-6-200x). This standard provides safety and performance requirements for limited-duty power sources designed for use by laymen in arc welding and allied processes.

NEMA has proposed the adoption of the standard, Arc Welding Equipment—Part 7: Torches (BSR/IEC 60974-7-200x). This standard provides safety and construction requirements for torches used in arc welding and allied processes.

NEMA has proposed the adoption of the standard, Arc Welding Equipment—Part 8: Gas Consoles for Welding and Plasma Cutting Systems (BSR/IEC 60974-8-200x). This standard provides safety and performance requirements for gas consoles designed to supply gases for use in arc welding, plasma cutting, gouging and allied processes in non-explosive atmospheres.

NEMA has proposed the adoption of the standard, Arc Welding Equipment—Part 11: Electrode Holders (BSR/IEC 60974-11-200x). This standard provides safety and performance requirements for electrode holders up to 10 mm in diameter used in manual metal arc welding.

NEMA has proposed the adoption of the standard, Arc Welding Equipment—Part 12: Coupling Devices for Welding Cables (BSR/IEC 60974-12-200x). This standard provides safety and performance

Fall Arrest Code Approved

The Z359 Fall Arrest Code, a new series of ANSI/ASSE fall protection/arrest standards, has been approved by ANSI. ASSE serves as secretariat for the Z359 Accredited Standards Committee (ASC) on fall protection and related systems. There has not been a new or revised general industry national consensus standard impacting fall protection/arrest in the U.S. for more than 15 years.

"The committee is very excited about the approval," says Z359 ASC Chair Randall Wingfield. "These new standards mean the Z359 series no longer applies only to manufacturers; it is a comprehensive resource for anyone with workers at height."

The series includes ANSI/ASSE Z359.0-2007, Definitions and Nomenclature Used for Fall Protection and Fall Arrest; ANSI/ASSE Z359.1-2007, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components; ANSI/ASSE Z359.2-2007, Minimum Requirements for a Comprehensive Managed Fall Protection Program; ANSI/ASSE Z359.3-2007, Safety Requirements for Positioning and Travel Restraint Systems; and ANSI/ASSE Z359.4-2007, Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components.

The Z359 family of standards will be available soon in both print and electronic formats. For more information, contact ASSE's Customer Service Department at customerservice@asse.org or (847) 699-2929 or check ASSE's website for details.

requirements for coupling devices designed for connection and disconnection without tools and used in welding and allied processes. (Adapted from *ANSI Standards Action*, Vol. 38, No. 22.)

RIA Standard Nationally Adopted

Robotics Industries Association's (RIA) standard, Robots for Industrial Environments—Safety Requirements—Part 1: Robot (BSR/RIA/ISO 10218-1-200x), has been nationally adopted. This standard provides guidelines for manufacturers of industrial robots in the safety design of such robots. This guidance is similar to but different from the current guidance in ANSI/RIA R15.06-1999 and supplements the current guidance in the American National Standard.

NECA Standard to Be Revised

National Electrical Contractors Association (NECA) plans to revise its Standard for Installing and Maintaining Temporary Electrical Power at Construction Sites (BSR/NECA 200-200x) to reflect changes in the 2008 National Electrical

*Standards Developments
continued on page 24*

NFPA 70E: How Much Do You Know about Electrical Safety?

By Dennis K. Neitzel, CPE

How much do you know about electrical safety? Are you knowledgeable of the electrical hazards of shock or electrocution, arc-flash and arc-blast? Numerous OSHA regulations as well as consensus standards address these hazards and the work practices and PPE required to protect employees.

Over the past 10 to 15 years, significant revisions and additions have been made to electrical safety standards and regulations to increase the knowledge and understanding of the electrical hazards. NFPA 70E, Standard for Electrical Safety in the Workplace, is one such standard. It requires that an electrical hazard analysis be performed prior to working on or near exposed energized electrical conductors and circuit parts operating at 50 V or more.

NFPA 70E introduced new terms that relate to the electrical hazards which a hazard analysis will identify.

These terms include *limited, restricted and prohibited approach boundary* for shock protection. The standard also identifies the *flash protection boundary* that must be established in order to protect employees from the arc-flash hazard.

These protection boundaries are identified by NFPA 70E, Section 110.8(B)(1), "Electrical Hazard Analysis." This section, along with sections 130.2 and 130.3, provide the requirements for performing the *electrical hazard analysis* with emphasis on the *shock hazard analysis* and the *flash hazard analysis*. Note the following OSHA requirements, which further emphasize the requirements for a hazards analysis:

• OSHA 29 CFR 1910.132(d)(1) states: "The employer shall assess the workplace to determine if hazards are present, or are likely to be

continued on page 26

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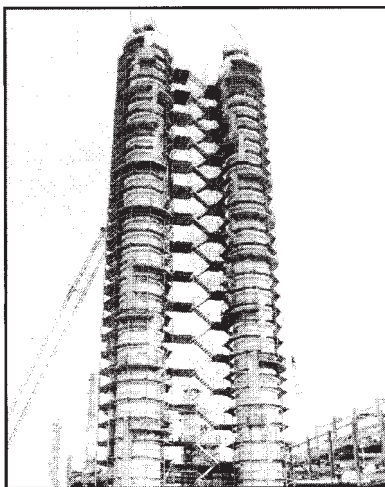
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Standards Developments

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Code. This standard describes installation procedures at construction sites for temporary power operating at 600 V or less. It addresses the planning, installation, expansion, maintenance, cutover and removal of the temporary power system and seeks to ensure a safe, adequate, functional and reliable temporary

electrical power distribution system for all trades on site. (Adapted from *ANSI Standards Action*, Vol. 38, No. 18.)

ALI Standards Under Revision

Three American Ladder Institute (ALI) standards are under revision: Ladders—Wood Safety Requirements (BSR A14.1-200x); Ladders—Portable Metal—Safety Requirements (BSR A14.2-200x); and Ladders—Portable Reinforced Plastic—Safety Requirements (BSR A14.5-200x).

A14.1 prescribes rules and establishes minimum requirements for the construc-

tion, testing, care and use of common types of portable wood ladders to ensure safety under normal use conditions. It does not cover stepstools (furniture-type) except for ladder-type stepstools.

A14.2 prescribes rules governing the safe construction, design, testing, care and use of portable metal ladders of various types and styles. A14.5 prescribes rules governing the safe construction, design, testing, care and use of portable reinforced plastic ladders of various types and styles.

For both A14.2 and A14.5, ladder styles include ladder-type stepstools and portable extension, step, trestle, sectional, combination, single, platform and articulating ladders but exclude:

- ladders in and on mines;
- ladders used for fire services;
- mobile equipment;
- hoisting equipment;
- work platforms;
- antenna communications towers;
- transmission towers;
- utility poles;
- chimneys.

A14.2 also does not cover special-purpose ladders that do not meet the standard's general requirements.

AMT Standard to Be Revised

Association for Manufacturing Technology (AMT) plans to revise its standard, Performance Criteria for Safeguarding (BSR B11.19-200x), to incorporate updates in safeguarding theory and technology. This standard provides performance requirements for the design, construction, installation, operation and maintenance of the safeguarding when applied to machines. (Adapted from *ANSI Standards Action*, Vol. 38, No. 21.)

AMT Standards Reaffirmed

Association for Manufacturing Technology's (AMT) standard, Machine Tools—Safety Requirements for Turning Centers and Automatic Numerically Controlled Turning Machines [BSR B11.22-2001 (R200x)], has been reaffirmed. This standard specifies the safety requirements for the design, construction, operation and maintenance (including installation, dismantling and transport) of turning centers and automatic, numerically controlled turning machines.

AMT's standard, Machine Tools—Safety Requirements for Machining Centers and Automatic Numerically Controlled Milling, Drilling and Boring Machines [BSR B11.23-2001 (R200x)], has been reaffirmed. This standard specifies the safety requirements for the design, construction, operation and maintenance

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- A1264.1 Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems
- A1264.2 Standard for the Provision of Slip Resistance on Walking/Working Surfaces
- Z390.1 Accepted Practices for Hydrogen Sulfide Safety Training Programs
- Z359.1 Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
- Z490.1 Accepted Practices in Safety, Health and Environmental Training
- A10 Safety Requirements for Construction and Demolition Operations



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(including installation, dismantling and transport) of machining centers and automatic numerically controlled milling, drilling and boring machines.

AMT's standard, Machine Tools—Safety Requirements for Transfer Machines [BSR B11.24-2001 (R200x)], has been reaffirmed. This standard specifies the safety requirements for the design, construction, operation and maintenance (including installation, dismantling and transport) of transfer machines. (Adapted from *ANSI Standards Action*, Vol. 38, No. 24.)

LIA Standards to Be Revised

Laser Institute of America (LIA) plans to revise its standard, Safe Use of Lasers Outdoors (BSR Z136.6-200x), to update Z136.8 for consistency with changes in ANSI Z136.1 and to review scopes and requirements that overlap the new Z136.10 standard. The standard provides guidance for the safe use of potentially hazardous lasers and laser systems in an outdoor environment. It also offers guidance for controlling disability glare from exposure to noninjurious levels of visible laser light, which might interfere with sensitive or critical tasks, and guidance for manufacturers of open-beam laser systems. (Adapted from *ANSI Standards Action*, Vol. 38, No. 17.)

LIA also plans to revise its standard, Safe Use of Lasers (BSR Z136.1-200x), to keep up with the latest research in laser bioeffects, which could impact maximum permissible exposure levels established in the standard. The standard provides recommendations for the safe use of lasers and laser systems that operate at wavelengths between 180 nm and 1 mm. Revisions will include new maximum permissible exposure levels and other changes to align the standard with ANSI Z136.2, ANSI Z136.3, ANSI Z136.5, ANSI Z136.6 and the proposed Z136.7, Z136.8, Z136.9 and Z136.10 standards. (Adapted from *ANSI Standards Action*, Vol. 38, No. 23.)

UL Standard Under Revision

Underwriters Laboratories Inc.'s (UL) Standard for Safety for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (BSR/UL 489-200x) is under revision. This standard covers:

- 1) ampacity;
- 2) steel as a current-carrying part;
- 3) reconciling Type B test conditions;
- 4) ignition-protected devices test;
- 5) interrupting test;
- 6) overload test operation;
- 7) voltage ratings of circuit breakers and circuit breaker accessories;

- 8) HACR circuit breakers;
- 9) single-pole 1,200 A circuit breakers;
- 10) 135% calibration test;
- 11) naval-use circuit breakers;
- 12) lock-on devices;
- 13) non-time-delay circuit breakers;
- 14) flammability test.

Changes in Standards Begin a New Era in Safety Markings

By Geoffrey Peckham

The upcoming publication of two revised ANSI standards will usher in a new era of safety markings technology and will have a dramatic effect on the goal of achieving global harmonization for safety signs and labels. These important revisions of ANSI Z535.2, Environmental and Facility Safety Sign Standard, and ANSI Z535.4, Product Safety Sign and Label Standard, will be published in early summer 2007.

The ANSI Z535.4 standard—the principle standard for on-product warnings—is used in court as a minimum for manufacturers to meet their “duty to warn.” Therefore, it is important for those responsible for facility safety and risk reduction to understand ANSI Z535.2. Safety professionals should actively strive to implement the new signage systems to advance a universal means of communicating safety information.

As the chair of the U.S. ANSI Technical Advisory Group (U.S. TAG) to ISO Technical Committee 145 (ISO/TC 145) since its inception, I can affirm that our goal has been to bring about the harmonization of safety marking standards so that the best principles for safety communication will be used worldwide to prevent injuries and deaths.

ANSI Z535's Credentials

Z535's predecessors are the 1970s-era OSHA regulations for safety signs and colors, namely the Z53 Standard for Safety Signs and the Z35 Safety Color Code. The Z53 and Z35 committees were combined in 1979 to form the ANSI Z535 Committee on Safety Signs and Colors. This committee has continued to develop the technology that underlies the systematic visual communication of safety information. OSHA recognizes compliance with the current Z535 standards as an acceptable alternative to its old regulations, calling this a “de minimus situation.” In effect, choosing to comply with ANSI Z535 is compliance with OSHA using the latest safety sign standards.

The first publication of the product safety label standard in 1991 (ANSI Z535.4) established a much-needed measurement for the U.S. legal system.

*Standards Developments
continued on page 26*

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Standards Developments

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Prior to its issue, product manufacturers created their own on-product warnings. The result was safety labels that were inconsistent, using a variety of colors, words, symbols and formats. Without a standard, the courts found it difficult to establish a baseline for what constituted an adequate warning. "Failure to warn" and "inadequate warnings" were and continue to be leading allegations in a large number of product liability lawsuits. As a result, the importance of using the ANSI Z535.4 Product Safety Sign and Label Standard cannot be overemphasized.

The ANSI Z535 committee included information in the Z535.2 and Z535.4 standards about what constituted the proper content for a safety sign or a product safety label. The standards define a product safety label and sign as devices that convey the nature of the hazard, how to avoid the hazard, the

consequence of interaction with the hazard and the seriousness of the hazard.

Globalization

Early on, the motivation behind the development of the Z535 standards was to establish a "national uniform system for hazard recognition." Beginning in the mid-1990s, a shift occurred toward an understanding that the goal should be an international system for safety markings. Manufacturers had markets for products that were increasingly global. The same was true for public areas and facility safety signs. An ever-larger number of people are traveling, and safety signs in both public areas and facilities must convey messages to an international audience.

The ANSI Z535 committee had to play an active role in the International Organization for Standardization's (ISO) parallel committee with the goal of the acceptance of the major concepts of ANSI Z535. If the world was going to move toward a global vocabulary for safety signs and labels, the U.S. needed to make every attempt to be a part of the process. Also, the Z535 committee wanted to explore the possibility of adopting the resulting ISO standard into the Z535 standards.

This process of harmonization is going on in nearly every sector of standardization because it is necessary to facilitate free trade in this global environment.

To accomplish these tasks, the Z535 committee formed a harmonization task force in 1995, which became the U.S. TAG to ISO/TC 145, the committee responsible for the principle international standards related to safety signs, labels, symbols and colors.

International Standards Came First

For the past decade, U.S. TAG to ISO/TC 145 has worked diligently with ISO/TC 145 to gain acceptance of the key principles underlying the format and content requirements found in the ANSI Z535 standards. Although ISO/TC 145 is charged with writing standards that use a wide variety of graphical symbols, it was the 2003 publication of the ISO 3864-2 Product Safety Labels standard that accomplished a major portion of the U.S. TAG's goal. This new ISO standard offers a variety of safety label formats that—taken together—represent a consistent label system. There were three major differences between ISO 3864-2 and the 2002 version of the ANSI Z535.4 standard.

NFPA 70E *continued from page 23*

present, which necessitate the use of personal protective equipment (PPE)."

- OSHA 29 CFR 1910.335(a)(2)(ii) states: "Protective shields, protective barriers or insulating materials shall be used to protect each employee from shock, burns or other electrically related injuries while that employee is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur."

NFPA 70E provides the direction for determining the level of the electrical hazards and the means to protect employees from them. NFPA 70E goes on to state that if circuits operating at 50 V or more are not deenergized (placed in an electrically safe work condition) then other electrical-safety-related work practices must be used. These work practices must protect the employee from an arc flash, as well as inadvertent contact with live parts operating at 50 V or more. Each analysis must be performed before an employee approaches exposed live parts, within the limited approach boundary. NFPA 70E, paragraph 130.2(B) FPN, provides a reminder that the flash protection boundary may be a greater distance from the exposed live parts than the limited approach boundary in some instances.

The shock hazard analysis is performed to: 1) determine the voltage to which a person would be exposed; 2) establish the shock protection boundaries; and 3) identify PPE requirements. To appropriately assess the electrical shock hazard associated with any type of maintenance or repair work, it is necessary to evaluate the procedures or work practices that will be involved. These practices should be evaluated against both regulatory and consensus standards requirements as well as recognized good practice within the industry.

The flash hazard analysis is performed in order to protect personnel from the possibility of being injured by an arc flash. The analysis also determines the flash protection boundary and the PPE that personnel working within this boundary must use.

Performing the electrical hazards analysis is vital to the safety of personnel who are or may be exposed to live parts operating at 50 V or more that are not placed in an electrically safe work condition. The analysis identifies not only the level of the hazards but also safety-related work practices that must be used to protect employees who might be exposed to the electrical hazards involved. Such work practices are required in order to protect each employee from arc flash and from contact with live parts operating at 50 V or more either directly with any part of the body or indirectly through other conductive objects. Work practices used must be suitable for the conditions under which the work is to be performed and for the voltage level of the live parts. Appropriate safety-related work practices must be determined before any electrical work is performed.

Dennis K. Neitzel, CPE, is a senior member of IEEE and is director of AVO Training Institute Inc. in Dallas, TX. Neitzel holds a bachelor's degree in Electrical Engineering Management and a master's degree in Electrical Engineering Applied Sciences. He has been a principle committee member for NFPA 70E, Standard for Electrical Safety in the Workplace since 1992, and has authored, published and presented many technical papers, books and articles on electrical safety, maintenance and training.

The ISO standard:

1) allowed a symbol-only approach to conveying safety information. This approach often makes sense in a multi-lingual and varied literacy environment or when space restrictions make text impractical.

2) changed the color scheme of the symbol that appears next to the signal word *danger*, *warning* or *caution* in the signal word panel to a black exclamation mark inside a black-banded yellow triangle.

3) relies heavily on graphical symbols formatted inside specific colored surround shapes. The color and shape of the sign designates the sign's overall safety meaning (Figure 1). For instance, a black symbol inside a yellow triangle is a "warning" sign that describes a hazard. A white symbol inside a blue circle is a "mandatory action" sign that communicates actions to be taken to avoid a hazard. A black symbol inside a red circular band with diagonal slash indicates actions not to be taken in order to avoid a hazard.

As with all ANSI standards, the Z535 committee revises or reaffirms its standards every 5 years. Although the committee acknowledged its need to harmonize with international standards in the mid-1990s, it could not harmonize with a moving target. Thus, the international standards had to be published before any ISO concepts could be included in the Z535 standards. The ISO standards were published in the early 2000s; the ANSI Z535 committee targeted the early summer 2007 revisions for harmonization.

Harmonization Realized

The ANSI Z535 committee accepted the ISO standard by reference. With the 2007 revision of the ANSI Z535.4 standard, manufacturers will have access to using the broader ISO system for formatting their safety labels, all of which comply with both the ANSI Z535 and ISO standards. The existence of a wider selection of formats from which to choose will require that informed decisions be made regarding which best suits a product and its intended audience. The primary point here is that this situation did not exist before; you were either in compliance with ANSI or ISO, never both. Now organizations can be in compliance with both standards.

The ANSI Z535.2 Standard for Environmental and Facility Safety Signs also changes in 2007. This standard will also now accept the use of the ISO formatted signal word panel shown in Figure 2.

Of even more importance is the fact that in 1998 this standard began the process of phasing out the use of the old 1970-era OSHA formats for safety

Figure 1

ISO Symbol-Only Safety Symbols



Figure 2

Signal Word Panels vs. Label Showing Use



Figure 3

OSHA-Style Signs Made Obsolete by Revised ANSI Z535.2



signs (Figure 3). The move away from the old formats culminates in the 2007 revision; the old OSHA formats are gone and the recommendation is made that all new signage use the formats corresponding to the ANSI Z535.4 standard for safety labels.

This change was made for two reasons. First, the newer formats are adaptable to communicating more information in the form of text and symbols. This is important as the requirement for a higher level of safety is creating the need for signage that communicates this specific information more clearly. Second, the use of uniform formatting for both facility signs and product safety labels means that with uniform standardization comes better awareness of hazards resulting in fewer injuries and deaths.

Because we live in a global society, it is in our best interest to incorporate international elements into safety signs and labels. As ISO/TC 145 continues to standardize safety symbols for specific hazards, these symbols and the universal formats discussed here will be used by safety professionals worldwide to usher in a new era in the visual communication of safety information.

Geoffrey Peckham is president of Clarion Safety Systems (www.clarionsafety.com), a designer and manufacturer of safety labels, signs and markings, and a member of ASSE's Northeastern Pennsylvania Chapter. Peckham has been a member of the ANSI Z535 committee since 1992. He has chaired the ANSI Z535.1 Safety Color Code since 1994 and has chaired the U.S. TAG to ISO/TC 145 since 1996.

Lean Concepts

Opportunities for safety professionals

By Fred A. Manuele

APPLYING LEAN CONCEPTS to eliminate waste, improve efficiency and lower production costs has become popular among senior-level management. Minimizing waste is the base on which lean concepts are built. A lean endeavor seeks to eliminate activities or processes that consume resources, add cost or require unproductive time without creating value. The concepts can be described as striving for excellence in operations in which each employee seeks to eliminate waste and participates in the smooth flow of value to the customer.

For safety professionals, lean represents an opportunity to make substantial contributions to the business process. When a lean initiative is proposed, safety professionals should tactfully and assertively call management's attention to an element of waste that should be addressed in the lean process—waste arising from the direct and ancillary costs of accidents.

For example, a safety director whose staff had convinced management through its accomplishments that they add value to the business process asked to be a part of the concept discussions as soon as he heard that lean concepts were being considered. He says

management quickly recognized that his counsel would be valuable in eliminating the waste which derives from accidents. (Another example of how SH&E staff was extensively involved in a lean design activity begins on p. 31.)

Direct accident costs are substantial—those costs are a form of waste. Ancillary costs, such as those related to interruption of work, facility and equipment repair, idle time of workers, training of replacements, and investigation and report preparation, may represent a greater amount of waste than direct costs. For incidents that result in severe injury—particularly when property damage is extensive—the ancillary cost and accompanying waste can be substantial.

Fred A. Manuele, P.E., CSP, is president of Hazards Limited, which he formed after retiring from Marsh & McLennan, where he was managing director and manager of M&M Protection Consultants. Manuele is an ASSE Fellow, an inductee into the Safety and Health Hall of Fame International and a recipient of National Safety Council's (NSC) Distinguished Service to Safety Award. He is also a former board member of ASSE, Board of Certified Safety Professionals and NSC, and a former member of ASSE's Editorial Review Board. Manuele is a professional member of ASSE's Northeastern Illinois Chapter.

Addressing Hazards & Risks Early in the Lean Process

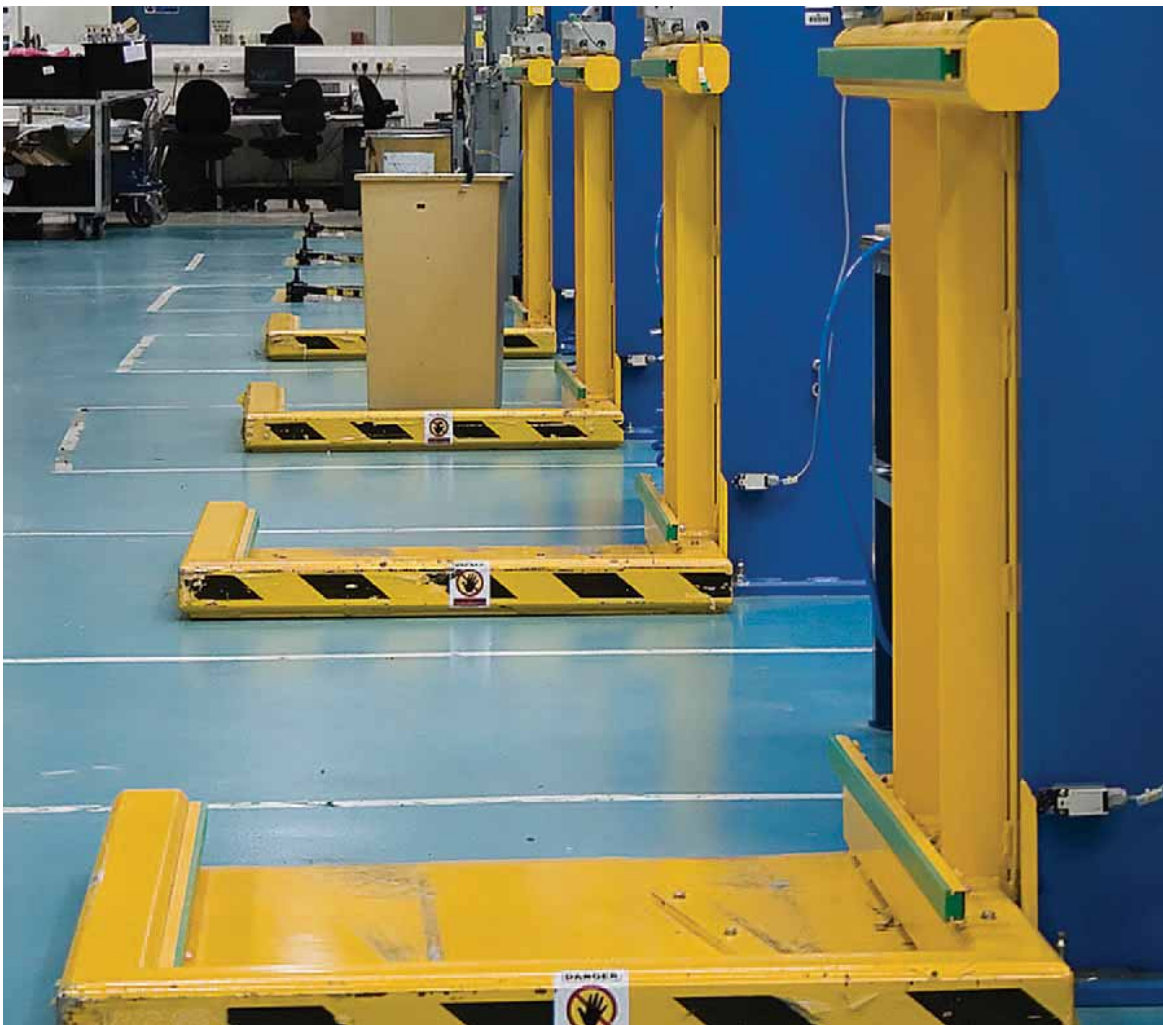
Since the goal is to minimize waste and reduce costs, it is logical to address safety considerations early in the lean process rather than as an afterthought. Unfortunately, many attempts at achieving lean have not included—or worse, have compromised—safety considerations. As a result, human capabilities and limitations may be given less consideration than is necessary to avoid injuries. Thus, hazards and risks are increased.

The author has observed situations similar to those about which Newman and Braun (2005) offer caution with respect to poorly designed tasks that do not adequately consider human limitations.

Unfortunately, lean doesn't necessarily mean safer though the two should go hand in hand. After all, a poorly designed task that requires a worker to reach excessively is not only inefficient, requiring more time and motion than needed, but is also likely to cause injury. Similarly, a worker lifting materials beyond his or her own capabilities takes more time and energy to perform the task and runs the risk of overexertion.

In the worst-case scenario, an overzealous company may implement extreme lean manufacturing strategies where safety is not merely overlooked, but compromised. In the end, increasing efficiency without incorporating safety will cost far more than it saves.

Minimizing handling and storing of materials and work in process, and avoiding interruptions in the workflow are central in the lean process. While all hazards and risks should be addressed in a lean process, applying ergonomics principles—both human and engineering—fits particularly well as the lean process moves forward. Another factor of waste to be avoided is the retrofitting expense and production time lost to correct hazards that may arise as a drive for lean is pursued.



Abstract: A lean endeavor seeks to eliminate activities or processes that consume resources, add cost or require unproductive time without creating value. The application of lean concepts throughout business and industry presents an opportunity for SH&E professionals to call management's attention to an element of waste that should be addressed in the lean process—waste arising from the direct and ancillary costs of accidents.

A Significant Opportunity

One colleague, John Garis, believes becoming engaged in the lean process presents SH&E professionals with a noteworthy opportunity.

I am an independent contractor specializing in safety and industrial hygiene. Two of my clients are engaged in a lean manufacturing process. I find safety to be very compatible with the lean process. In fact, I have a sense that lean can be used to elevate the overall safety aspects into that realm that we as safety professionals have talked about for decades—that is, the engagement of everyone from senior executives to department managers, to line supervisors and finally to the hourly staff into the safety process.

To do that well, an important first step is to treat safety as an ongoing process rather than a program. Lean is a continuous improvement process, not a program. My accounts that have achieved success with lean and continuous improvement for the prevention of waste and manufacturing errors are also successful in instilling those same “process” ideas into safety.

Origin of the Lean Concept

Much of the literature recognizes Taiichi Ohno as the originator of the lean concept about 50 years ago, while he was with Toyota—a company that has been highly successful in applying the concepts. However, some literature also reports that the concepts were applied in the early 1900s by Henry Ford, who created the first “lean” auto production line; Frank Bunker

Gilbreth, who was a proponent of scientific management and motion study; Walter Shewhart, a pioneer in statistical control; and W. Edwards Deming who achieved renown for his work in quality management.

Whatever the origins of the concepts, the leaders at Toyota, as they pursued operational excellence, combined, refined and converted them with great success into what is now called lean in the U.S.

Lean Concepts Are Broadly Applicable

While the early literature on lean concepts describes their application in manufacturing, the concepts have been adopted to minimize waste in a wide range of enterprises and activities—from accounting systems, depot operations, service businesses and transportation companies, to warehousing, construction, healthcare facilities (including entities as small as group physician practices), product quality improvement and environmental management. The concepts also have been used to eliminate non-value-added e-mail.

Safety professionals with environmental management responsibilities may want to download EPA's The Lean and Environment Toolkit Version 1.0 (EPA, 2006). A major section in the toolkit is titled “How to Incorporate Environmental Considerations into Value Stream Mapping.”

How broadly have lean concepts been applied? Using the phrase “lean concepts” in an Internet search returns more than 11 million results. Clearly, getting into lean concepts spells opportunity for safety professionals.

Definitions

Given its origins, several terms associated with lean concepts are Japanese. Following are abbreviated definitions of those terms as they are applied in the design process discussed here, along with several other key definitions.

- **Flow**, as a goal in the lean process, is achieved after waste is removed from the system and the improved process (value stream) runs smoothly and efficiently with a minimum of waste in the work of personnel or in equipment downtime.

- **Jidoka** refers to machines or the production line itself being able to stop automatically when abnormal conditions arise—such as when a machine breaks down or temperature rises beyond a set limit. Jidoka applications do not allow defective parts or products to go from one workstation to another.

- **Kaizen** in Japanese means change for the better. In American English, the term has come to mean continuous improvement. For the purpose of this article, the emphasis in applying the continuous improvement process is to eliminate waste (those activities that add to costs but do not provide value).

- **Muda** encompasses all activities that wastefully consume resources but do not add value. Seven types of waste were identified at Toyota for which continuous reduction was to be obtained.

- 1) *Defects* in products or services are wasteful in that they consume material and require additional production and correction time.

- 2) *Overproduction* is the production or acquisition of items beyond what is actually needed. Where this occurs, additional capital investment is necessary, and costs are increased since additional storage space is necessary, but no value is added. It also results in excessive material handling and its accompanying risks.

- 3) *Transportation* waste is that which requires additional and unproductive moving of a product in process. Each time a product is moved there is added risk of damage to the product, equipment and facilities, as well as of harm to personnel. In the moving process, the product fills valuable space and requires time expenditures without adding value.

- 4) *Waiting* refers to both the unproductive time spent by workers waiting for material or components in a process to arrive and the time required for excess production to flow through the system. Another example is material or information waiting to be worked on to complete a customer order. Similar wastes occur when incidents that could result in injury occur.

- 5) *Inventory* in excess of what is needed requires an additional capital outlay and produces waste because of the additional storage space and handling time involved. As noted, frequent handling of inventory adds to the risk of injury.

- 6) *Motion* refers to workers' unproductive time and movement where the process is cumbersome, inefficient and wasteful. This implies that the process also may be hazardous.

- 7) *Overprocessing* means using a more expensive

or otherwise valuable resource than is needed for the task. It also includes costly rework.

- **Poka yoke** means mistake-proofing or fool-proofing. The purpose is to design work and processes so that it is nearly impossible for people to err. An example is designing hose or electrical connections so that they can be assembled in only one way, thereby reducing risk. This is an important, yet often-neglected concept with respect to employee and product safety.

- **Mura** pertains to unevenness in the workflow. The goal is steady workflow.

- **Muri** relates to avoiding overburdening equipment or employees. The goal is to reduce overburden to acceptable levels. For equipment, that might require operating at 80% of the specified limit; for employees, designing work methods that are overly stressful and working excessive hours is to be avoided.

- **Pull** defines the operational situation after which much has been accomplished in applying the lean process and inventories can be maintained in relation to the "pull" as represented by customer orders. Waste from having excessive inventory (and all that implies) is minimized (e.g., the cost of excess space, the financing of the excess inventory, the cost of additional handling of inventory).

- **Total productive maintenance** ensures that all equipment used in a process can always perform its tasks so that production or work processes will not be interrupted.

- **Value stream** includes every step in a process to produce a product or provide a service—from the receipt of materials to the delivery of the product or service.

- **Value stream mapping** is the written or computer-based identification of each step in the value stream to identify the sequence of activities and information flows to produce a product or deliver a service (see sidebar on pg. 31). This is a vital step because it provides opportunity for team brainstorming to identify activities that do not add value. Lean practitioners use value stream mapping to:

- 1) identify major sources of non-value-added time in a value stream;

- 2) envision a less-wasteful future state;

- 3) develop an implementation plan for future lean activities.

On the Lean Literature

One can find plenty to read on lean, but popular texts contain few references to accidents as a waste factor. This is demonstrated, for example, in *Lean Thinking: Banish Waste and Create Wealth in Your Corporations* (Womack & Jones, 2003). According to its dust jacket, the book "has been sold in the hundreds of thousands of copies in a dozen countries." Obviously, it is a popular book, but it contains few references to accidents as a waste factor.

For safety professionals, that omission represents both a problem and an opportunity to make their presence felt. Progressive safety professionals will recognize this shortcoming—the nonrecognition of

A Simplified Initial Value Stream Map

Identifying Waste (Muda) & Opportunities for Continuous Improvement (Kaizen)



1) Defects: The machinery at Station A is old and worn. Regardless of the amount of tinkering, it cannot achieve a quality defect level lower than three parts per thousand. Producing defects at that level, far below customer specifications, is wasteful.

2) Motion: At Station A, the machinery must be adjusted often and die changes must be made frequently. That is wasteful motion and adds risk. Also, the lockout/tagout device is more than 100 ft from the machine. Such an arrangement is error-provocative, and getting to and from the device wastes time.

Because of customer specifications, all parts processed at Station A are inspected at Station B. Parts are moved to Station B in carts. Since the casters on the carts are too small, moving them is cumbersome and time-consuming. The carts are unstable as well. They have tipped over, injuring workers and damaging parts. This inspection motion is expensive, wasteful, boring and adds elements of risk.

3) Overproduction: At Station C, the machinery processes parts faster than can be handled by the remainder of the production line. Thus, materials in progress get stacked in aisles

until they are transferred to a storage area. Having excess materials in process is wasteful. It also requires stressful manual material handling, which presents ergonomic risks.

4) Transportation: Station D represents the wastes deriving from the additional storage space and material handling needed because of overproduction at Station C. The storage configuration is not conducive to efficiency. Aisles are narrow. Powered vehicles have collided and struck workers, and materials have been damaged.

5) Waiting: Although overproduction occurs at Station C, personnel at Station E often are not fully occupied, and waste occurs while they wait for other components to be delivered. Inventory controls are inadequate, and the motorized delivery system is inefficient and risky.

6) Inventory: The inventory at Station D is greater than needed and thereby wasteful. Excessive material handling is necessary.

7) Overprocessing: Because the quality level achieved at Station A is inadequate, considerable parts must be reworked at Station F. This wastes resources and use of the machinery in the process adds risk.

accidents as a source of waste by proponents of lean concepts—as an opportunity to educate management on the advantage of including safety considerations as the lean process is applied.

A Major Work in Progress

Other safety professionals have recognized the absence of safety in the lean literature. They also have encountered situations where safety concepts and lean applications were in conflict, leading to unsatisfactory results. Association for Manufacturing Technology (AMT) is finalizing a technical report titled *Designing for Safety and Lean Manufacturing: A Guide on Integrating Safety and Lean Manufacturing Principles in the Use of Machinery*, which is to be published as ANSI B11.TR7-2007 in mid-2007.

The abstract from the report is as follows (reprinted with permission).

TR7 Abstract

Lean manufacturing includes a variety of initiatives, technologies and methods used to reduce waste, costs and complexity from manufacturing processes. The intent of applying lean concepts is to achieve better and faster throughput with less waste and the related benefits thereof. However, in the effort to get lean, safeguarding systems intended to protect personnel can be defeated resulting in greatly increased risks. Yet safety can be effectively included in the lean manufacturing effort to yield processes that are better, faster, less wasteful and safer. This document provides guidance for persons interested in how to concurrently address lean manufacturing concepts and safety concerns of machinery.

A brief overview of lean manufacturing concepts is presented and examples demonstrate situations where this has not occurred. The chal-

lenge of concurrently addressing safety and lean is described and examples demonstrate situations where this has not occurred. A process model for safety and lean is presented. A risk assessment framework is outlined that demonstrates how lean manufacturing concepts and safety can be implemented concurrently. Examples of where safety and lean have been successfully applied are shared. This document also provides design guidelines on how to meet lean objectives without compromising safety.

Although its purpose is to address lean and safety concepts in the use of machinery, the report will be valuable to all safety professionals who become involved in lean. Its content is largely generic and the principles apply to all enterprises.

As its title implies, the report will be an excellent resource for those who want to understand how the lean process and safety principles can be melded to reduce waste while maintaining acceptable risk levels. TR7 provides guidance—from the initial concept stage for design and redesign through to operational waste reduction applications—on how the lowest waste at the lowest risk can be achieved, and helps fill the gap in the technical literature on the topic.

Merging Lean & Design Concepts

All but one application of lean concepts with which the author has become familiar involve removing waste from operating systems. In the one exception, a pharmaceutical company merged lean concepts into the original design considerations for a major project in which new equipment was to be acquired and installed in an existing facility. In lean language, that would be a “brownfield” application. When design engineers incorporate lean concepts into the design of an entirely new facility that is a “greenfield” application.

What the pharmaceutical company has done is an excellent example of how lean and safety can be addressed concurrently in the design process. Although this is unique, imaginative and creative in the author's experience, the idea has been applied elsewhere. For example, Womack and Jones (2003) report that lean concepts were applied in the design of the Toyota auto manufacturing plants built in the U.S.

This company's initiative also is particularly noteworthy in that it incorporates relative provisions in ANSI/AIHA Z10-2005. Those provisions are:

Z10 Provision	Section Designation
Risk assessments	4.2
Hierarchy of controls	5.1.1
Design reviews	5.1.2
Management of change	5.1.2
Procurement	5.1.3

This article presents an abbreviated version of this company's process. It is close to the theoretical ideal—and safety professionals can learn from it.

Criteria for Applying the Lean Design Process

In this company, use of the lean design process commences when an assumption is made that a project is of such magnitude that it will require following the steps outlined in the firm's Request for Capital Expenditure Procedure. Practical application of the process has been demonstrated in the company that developed it. All operations personnel at this location have received lean training.

For purchases below the capital expenditure request level, the basics in the process are applied but not as extensively. For example, if the machine shop supervisor requests the purchase of a metal-cutting saw, safety considerations would be established and they would be reviewed by SH&E professionals as well as more than one level of management. Those safety requirements would be included on the purchase order. Once the equipment was received and installed, a safety validation would occur.

The Company's Lean Design Process

1) The Concept Stage

An idea for process improvement may be proposed by any source—research and development, engineering, any operations department, a cross-functional group, maintenance, individual workers. A broad range of team-based brainstorming then takes place.

If it is concluded that the idea should be pursued and the expenditure level requires following the organization's capital expenditure procedure, the team seeks senior management review and tentative approval. A project manager is assigned as well.

2) Capital Expenditure Request & Element Champion Review

The capital expenditure request would describe the project's design objectives, make the business case for it and request the necessary funding. In this company, each of the 26 elements in its safety management system is assigned to a champion, who most often holds an upper-level management posi-

tion. For example, the CEO assumes direction and accomplishment responsibility for two of those elements, while four are assigned to a senior manufacturing executive. At this stage, all safety management system element champions are aware of the project and each must sign off on it.

3) Identify the Customers/Users

A customer/user in this context means every employee who may be affected by proposed process revision. It really means everyone. The purpose is to ensure that all those who could be affected are aware of the proposed process change and can provide input as the activity proceeds.

Identifying the customers/users is considered an important step in the lean process. With respect to external customers, the characteristics of the products manufactured are agreed upon; product amounts that will be purchased and over what time spans are estimated; inventories are tightly controlled; and delivery methods and schedules are arranged.

4) Project Customers/Users Requirement Specification

At this point, a senior-level manager prepares a document expanding on the original idea. This document contains enough detail to specify the outcomes expected and some criteria are established. Customers/users may submit their specifications and suggestions on how waste can be eliminated.

5) Value Stream Map

A value stream map is created at this point. This is a preliminary flowchart that includes each step of the production process as conceived at this time—from raw material receipt to product shipment. It is an important step in that it documents the processes to be considered as the waste potential is eliminated.

6) Project Conceptual Design

All that preceded this step in the process influences the drafting of the project conceptual design. It shows the proposed layout, as well as building and utility impacts, and contains specifics on the major equipment needed. SH&E considerations are addressed at this stage as well.

Over time, this company has evolved design standards that are unique to its needs. SH&E specifications are incorporated in them. (In researching how companies meet the design review provisions in Z10, the author has found that universally applied design standards do not exist. Each company's engineering personnel draft the standards they consider appropriate.)

The following personnel review and sign off on the concept design: operation executives; subject-matter experts; SH&E professionals; engineering; maintenance personnel; and the building manager.

7) Change Control Provisions

This company operates under the regulations of several governmental entities. Therefore, a rigid change control system is in place to ensure that all quality, safety and environmental requirements are met. Food and Drug Administration (FDA) is one of

The 5S Concept

When reviewing this article, one of the originators of the pharmaceutical company's lean design process commented, "We have found that 5S is one of the foundations of lean. As far as safety is concerned, nothing makes hazardous conditions and practices stick out more than a well-organized facility. You should expand on 5S and how it can help improve safety performance."

This premise required further study of how the 5S program operates in this facility. How well does it work at this location? Those involved say that the 5S program is an underlying reason for receiving numerous awards on employee safety, environmental affairs management and product quality. All 5S applications are not quite the same as what was observed at this location, either for lean or safety purposes.

Supporters of 5S who say that the concept can have a solid impact on worker safety contend that it is folly to expect good work practices and outstanding performance from workers if the work environment is dismal, messy and disorderly, and operational discipline is lacking.

Sorting, the first step in a 5S application, is to eliminate everything not needed to achieve an atmosphere of orderliness. When that orderliness is achieved in operational and storage areas—both for work in process and equipment needed to do the work—efficiency and housekeeping are improved, hazards and risks are reduced, and time wasted searching for work items is eliminated.

Simplifying is the next step. If there is a place for everything retained, and those places are well marked and labeled and are known to staff, it is easier to find tools, parts and the equipment needed to do a job and keep things orderly. Simplifying in a disciplined manner promotes identification of hazardous situations and makes it easier to get things done with less risk.

Systematic cleaning is the third step in 5S. Everyone is to be involved in this endeavor. Workers in a unit are assigned ownership of and responsibility for the cleaning tasks. The purpose is to produce orderliness. Dirt, disorder, and items blocking aisles or stored in some manner that makes their retrieval hazardous are not tolerated. The cleaning processes focus on enhancing operational efficiency, eliminating waste and reducing risk.

Standardization, the fourth step, is to adopt the best practices for equipment and machinery layout, and design of equipment and work practices for productivity, mistake-proofing and continuous improvement. Workers at all levels have opportunities for input into the standardization procedure. Comments are sought on the design of the work methods for efficiency as well as to minimize risks.

At the location in this case, accidents are recognized as a form of waste and safety is an integral part of the standardization process. Performance standards and expectations for predictable results are set.

A minimum of operational break-

downs is expected. Root-causal factors for operating problems are studied and largely eliminated on an anticipatory basis. Front-end prevention is the thinking. Methods to identify possible breakdowns and how to respond with minimal waste when they occur are a part of the standardization procedure. This makes work easier for maintenance personnel because they are exposed to fewer hazardous situations and jury-rigging because unusual work is not condoned. All involved understand that maintaining tight control over the management-of-change procedures is an integral part of the standardization element in 5S.

Sustaining what is accomplished in the four previous steps is the fifth step. According to the pharmaceutical firm, this is the most difficult step once superiority has been attained in the first four. It is expected that some workers may revert to previous practices, particularly with respect to cluttering the workplace and avoiding cleanliness. The concept can only be sustained by continuous management leadership. The CEO says that he knows he must continuously and personally embrace the 5S concept and both "talk the talk" and "walk the talk," repeatedly. He holds his staff accountable for sustaining what they have achieved—an orderly and stable work environment in which efficiency is at a high level, waste is minimal, and hazards and risks are at an acceptable level.

those agencies. Change control requirements applied by FDA are unique to pharmaceutical companies. They are the most extensive change control requirements the author has observed. This company maintains that strict concept for all of its change control systems.

At a senior management level, a change control document is produced that must be approved by all department heads. In ANSI Z10, the comparable requirement is to have a management-of-change process in place.

8) Project Safety Clearance & Lean Review

This is a summation step. The design document is reviewed by the SH&E group and the compliance group. These groups assess the need for further safety analysis of individual pieces of the process or because of their interrelationships. Safety specifications are expanded and become more specific.

Although lean considerations have been a part of this process from the beginning, application of lean concepts is stressed more rigorously at this stage by the project manager. The purpose is to error-proof,

eliminate waste, have the process stop when the equipment recognizes a fault and avoid rejects. All or some of the lean systems defined (e.g., Poka Yoke, Jidoka, Kaizen, Muda) may be brought into play, but Muda concepts prevail throughout. Waste is to be at a minimum.

This company meticulously applies the 5S system (which the firm defines as sorting, simplification, systematic cleaning, standardization and sustaining), so 5S concepts are prominent in the lean process. A senior executive at this location noted, "If the staff has not been educated in 5S concepts and believe that their substance is a core value, you can forget about lean. You must have established a stable environment in which waste elimination is a fundamental to move into the next step to accomplish lean" (see sidebar above).

9) Drafting Vendor Specifications

Engineering department personnel draft vendor specifications although manufacturing, SH&E and operating personnel may also be involved. At this stage, communication begins with a selected vendor.

Subject-matter experts employed by the vendor may help to draft project specifications.

10) Conceptual Design Risk Assessment

This review occurs at the concept and drawing level. Formal risk assessment methods—qualitative or quantitative—are used as required. The risk assessments are documented and approved by a multifunctional team, of which SH&E personnel are a part. An independent reviewer who is not a part of the project team also must sign off on the risk assessments. Several people at this location have been trained to perform failure mode and effects analyses.

11) The Preliminary Design

Project team members work with the vendor to ensure that the users' (in-house personnel) requirements are met. The receivables from the vendor include schematics, flow diagrams, drawings, further component specifications, and operating procedures and training manuals.

12) Value Stream Map: Waste Scavenger Hunt

A value stream map is initially created when the project is in the concept stage. At this phase, a flow-chart that depicts the proposed design is created and reviewed. As noted, Muda encompasses all activity that wastefully consumes resources but does not add value. This waste scavenger hunt is designed to further minimize product defect possibilities, over-production, excessive product handling, idle and waiting time by operating personnel and excessive inventory, while ensuring efficiency in processing and the best possible use of employee skills. All personnel levels are involved.

13) Proposed Design Safety/Risk Assessment: Create System Drawings

Now that a proposed design is available, additional risk assessments are conducted—before the system is built. SH&E staff are prominently active in these assessments as are other personnel. Use of formal risk assessment methods is more frequent at this stage. A final sign-off by the independent reviewer is required.

At this point, the design is frozen, and the vendor creates system drawings and builds to them.

14) Safety, Operational & Lean Review

At the vendor's location, the purchaser's SH&E personnel ensure that all safety-related specifications have been met before equipment is shipped. Factory acceptance testing is performed and review team members (representing engineering, operations, maintenance, validation, etc.) determine that the equipment operates as expected and that waste is at a minimum. This is a large part of the approval process before shipment. Staff has found that testing at this level has avoided many issues that would have had to be resolved later on their shop floor.

Review by maintenance is especially important as their sign-off affects the company's ability to apply a total preventive maintenance initiative. With approval, the equipment is shipped to the purchaser.

15) Standard Work Procedures

In reality, this function is conducted in parallel with the previous steps. It involves writing standard operating procedures, developing training modules, defining recordkeeping needs, drafting production records and related issues.

16) Facility Review & Approval

After installation, in which the vendor is extensively involved, site acceptance tests are performed. The project team, including SH&E personnel, must approve the installation before acceptance. The purpose is to validate that the equipment performs as intended, that the quality level expected is achieved and that SH&E specifications have been met.

17) In Production

At this stage, Kaizen (continuous improvement) is a governing concept. Superior quality is maintained. Adherence to standard operating procedures—including safe practices—is the norm. Waste is constantly sought and eliminated.

18) 5S Review

Since this organization has made applying the 5S system a core value, a final review is made to ensure that all of its elements (sorting, simplifying, systematic cleaning, standardization, sustaining) have been maintained.

Conclusion

Because of the base on which lean concepts have been built—the idea of removing waste from a system—applying the concept likely will have staying power. Since accidents and their consequences are so fundamentally wasteful, preventing them should be an integral part of lean applications.

From the beginning, when an organization initiates discussion of adopting lean concepts, safety professionals should step forward to become members of the lean team. This presents an opportunity to address hazards and the risks that derive from them in process design and redesign so that acceptable risk levels are achieved. To do so, safety professionals must become familiar with lean concepts. ■

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From Research to Practice

Strategies and examples from NIOSH

By Nancy Stout and DeLon Hull

NIOSH'S OVERALL GOAL is to prevent illnesses, injuries and fatalities caused by hazards on the job. Through its Research to Practice (r2p) initiative, which integrates the agency's strategic goals of knowledge generation and knowledge transfer, NIOSH translates research findings, technologies and information into highly effective prevention practices and products that can be adopted in the workplace.

The two basic tenets of r2p are relevance and impact. They are accomplished by involving partners and stakeholders throughout the research process—conceiving, planning, conducting, translating and evaluating research—and providing research results to users in a manner and format most useful to them.

Effectively communicating and transferring workplace injury prevention research to practice depends on partnerships with organizations, associations and research institutions, including industry, manufacturers, policy makers, employers and workers themselves. To successfully translate research to practice, researchers must identify and involve the appropriate recipients from the conceptual phase of the study in order to ensure the relevance of the research and to enable workplace implementation of research results for injury prevention.

Through active partnerships with stakeholders, NIOSH focuses research on the most critical occupational safety and health issues; develops useful products; translates research findings into practice; targets dissemination efforts; and evaluates and demonstrates the effectiveness of these efforts in positively affecting worker safety and health. This article describes roles and methods for transferring occupational safety research to practice and provides examples of successful strategies used by NIOSH.

Overview of Strategies

Many different entities have the ability to—and responsibility to—translate and transfer workplace injury prevention research to practice. Only recently, however, has the scientific occupational injury prevention community recognized that researchers also must take responsibility for ensuring that the results

of their research are transferred to or toward workplace application. It is no longer sufficient to accept publication of results in scientific literature as the sole endpoint of researchers' responsibility.

Every research effort—from surveillance and basic laboratory research to field and evaluation studies—must have at least one recipient who will carry out the next step in moving the knowledge or technology toward workplace implementation. There are various types of r2p recipients as well as methods for researchers to facilitate the transfer of research results to practice. Examples include: those who translate scientific information into worker-friendly guidance or training materials; manufacturers who develop and market safety technologies; regulators and employers who promulgate new safety policy; consensus standards bodies that develop or modify guidelines and voluntary standards; trade and labor organizations that promote new safety and health practices; and companies that implement new technologies, processes and practices to prevent injuries among their workforce. The following examples illustrate the roles and methods of transferring research to practice.

Translating Scientific Information into Safety Training Materials

The NIOSH Fatality Assessment and Control Evaluation (FACE) Program identifies prevention strategies based on in-depth investigations of selected types of deaths. Each investigation results in a report that describes the incident and includes recommendations for prevention of similar fatalities. NIOSH has finalized reports on more than 1,600 occupational fatality investigations and has posted them at www.cdc.gov/niosh/face. Examples of FACE report titles include:

- Hispanic Laborer Electrocuted when Crane Boom or Load Line Contacts 7,200 V Overhead Power Line (North Carolina);

Abstract: *Through the Research to Practice initiative, which integrates NIOSH's strategic goals of knowledge generation and knowledge transfer, NIOSH translates research findings, technologies and information into prevention practices and products that can be adopted in the workplace. The ultimate goal is to provide research results to users in a manner and format most useful to them.*

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- Traffic Control Supervisor Dies when Struck by an Asphalt Dump Truck while Picking Up Cones on a Roadway Work Zone (Tennessee);

- Sixteen-Year-Old Hispanic Youth Dies after Falling from a Job-Made Elevated Work Platform during Construction (South Carolina);

- Hispanic Roofer Dies after 15-Ft Fall from a Roof (North Carolina);

- Youth Farm Worker Dies after Falling into Operating Feed Grinder/Mixer (Ohio).

The agency has received feedback on the range of ways in which these reports have been used to develop safety training programs. For example, Alberta, Canada, has upgraded its safety laws to require employers to provide their workers with extensive job training in many areas. A training consultant is now developing training modules for a major training facility in Alberta, using FACE materials as the base for several modules. In addition, the reports are used as examples of actual incidents presented to classes.

The reports also are used by many safety training developers, professional trainers and institutions of higher learning. Education and training provides workers and their employers with heightened awareness of potential hazards and ways to reduce exposure and help prevent injury and death. Using NIOSH research findings as the basis for worker training materials is one important way to move research to practice.

Developing Worker-Friendly Guidance

NIOSH also translates scientific findings into worker-friendly guidance through the development of documents called Workplace Solutions. These publications are targeted primarily to workers and employers. They use the results of NIOSH research to describe hazards and prevention measures in a manner that is easy-to-understand, easy-to-access and easy-to-implement. Topics include:

- Preventing Injuries when Working with Hydraulic Excavators and Backhoe Loaders;*

- Preventing Electrocutions of Crane Operators and Crew Members Working Near Overhead Powerlines;*

- Preventing Deaths and Injuries to Firefighters during Live-Fire Training in Acquired Structures;*

- Preventing Injuries when Working with Ride-On Roller/Compactors;*

- Preventing Injuries from Installing Drywall.*

To ensure that this information reaches the right audience, NIOSH works with organizations and associations that can provide mailing lists of workers or employers who are directly affected or that can help to distribute the information. For example, during 2000 and 2001, NIOSH received five reports of worker deaths associated with excavators or backhoe loaders as part of the FACE program. In response to these incidents, NIOSH (2003) developed a Workplace Solution titled *Preventing Injuries and Deaths when Working with Hydraulic Excavators and Backhoe Loaders*.

This publication is a nontechnical, concise version of research targeted to end users—SH&E practitioners, employers, supervisors, operators, foremen,

workers and worker representatives. The hazards and recommendations identified in this document apply to many manufacturers and types of construction equipment. For distribution purposes, Association of Equipment Manufacturers provided an international mailing list with more than 200 records. Several OSHA regional offices are also distributing copies. Positive feedback from manufacturers and operators of this machinery demonstrates the usefulness and application of this material.

Another example resulted from FACE investigations which demonstrated that operating cranes beyond their safe working lifting capacities may be the most significant risk for crane-related injury. NIOSH assembled a packet documenting crane-related injury risks and steps to prevent worker death and injury. This packet contained a sample of four fatality investigation reports and a page from the *NIOSH Alert: Preventing Electrocutions of Crane Operators and Crew Members Working Near Overhead Powerlines* (NIOSH, 1995).

The packet was mailed to approximately 4,600 crane rental and crane service establishments nationwide. Feedback indicates that the packet is being used for training purposes, toolbox talks and as support for safety program development. One crane rental company requested more than 100 copies in order to issue a copy with each crane rented.

In addition, OSHA's Training Institute includes copies in the training material for its crane safety courses. American Bureau of Crane Inspections requested 1,000 packets for use in its programs as well. One construction contractor who requested multiple copies wrote to the agency and said that the packet was "the most useful safety tool I ever received from the government. I had heard about the accidents, but didn't know the causes. I will circulate the publication among my employees who work with cranes. It will give us an opportunity to discuss crane safety using real-life examples."

Promulgating New Safety Policy

In February 2005, the most significant changes to U.S. child labor laws in decades went into effect. These changes have the potential to reduce young worker deaths and injuries associated with working on roofs, compactors and balers, driving and the manufacture of explosives. NIOSH played a critical role in the revised U.S. Department of Labor (DOL) regulations, providing input and recommendations on the proposed changes based on science. The agency's research was cited among the justifications for the rule changes.

As part of an ongoing DOL effort to promote positive, safe work experiences for youth while ensuring necessary and effective safety protections, DOL contracted with NIOSH to review available data and make recommendations for additional changes to regulations that prohibit 16- and 17-year-olds from performing especially hazardous work. DOL is actively considering these additional recommendations in the U.S. child labor policies.

Another example of NIOSH research affecting regulatory policy comes from the agency's state-based FACE program. In 1994, the New Jersey FACE program investigated a work-related fatality that involved a 20-year-old lifeguard who was electrocuted when he touched a water pump which was energized because of an electrical fault in the pump motor. Recognizing that similar conditions might exist at other public pools within the state, New Jersey Department of Health (1995) published a bulletin titled *Electrocution Hazard for Employees at Public Swimming Pools* and sent 3,200 copies to local health departments for distribution during their biannual swimming pool health inspections.

As a follow-up, NJFACE sent surveys to 270 swimming pool directors to determine whether their pools had been inspected and whether electrical hazards were identified. Seventy-three percent of respondents who had received the alert indicated that they had their swimming pools inspected—and 37% reported finding electrical problems.

In response to the lifeguard electrocution, Old Bridge, NJ, passed an ordinance in October 1994 requiring periodic inspections of swimming pools to help prevent electrocutions. During 1995, 15 of the town's 21 pools (71%) failed their initial inspection because they did not meet electrical requirements. In 1996, members of that state assembly and senate introduced bills modeled on the Old Bridge swimming pool ordinance. The NJFACE alert bulletin was cited in the bill's narrative to justify the new law.

After several years of discussion and modification, New Jersey Pool Law, PL1998c137, was signed into law in December 1999. The law requires pool owners to obtain a bonding and grounding certificate and an electrical certificate of compliance before opening the pool. As of January 2004, no additional work-related electrocutions have been reported at New Jersey swimming pools.

Developing or Modifying Guidelines & Voluntary Standards

To improve safety eyewear, NIOSH conducted research to develop several tools:

- a metric for evaluating coverage provided by safety eyewear;
- computer software to evaluate the coverage coefficient of digital eyewear models;
- a laboratory-based device for evaluating coverage coefficient.

One goal of this project was to introduce quantification of eyewear coverage into the U.S. consensus safety eyewear standard, ANSI Z87.1-2003, Occupational and Educational Personal Eye and Face Protection Devices consensus standard. The ANSI Z87 Accredited Standards Committee is charged with developing the national consensus standard for eye and face protection. As a result of this research, NIOSH representatives were invited to participate on the editorial committee that prepared the draft standard for final public review and full committee ballot.

This effort required preserving the foundation of the previous revision of the standard while incorporating new guidelines and modifications suggested by committee members and the public. For the first time, this standard applies high-velocity testing to prescription lenses and allows for a distinction between basic eye protection and high-impact protection. The revision took important steps toward improving the required level of protection of prescription safety eyewear by requiring high-velocity impact testing. By removing design restrictions and progressing toward a performance-based standard, new and innovative eyewear products can be developed that look stylish while providing enhanced worker protection. This results in both better protection and increased acceptance and use in the workplace.

Promoting New Safety & Health Practices

The widespread use of wireless communication services has fueled the construction of telecommunication towers to hold transmitting devices. Gross estimates of the risk for fatal injury suggest fatality rates 10 to 100 times the average across all industries (NIOSH, 2001b). Based on results of FACE investigations, NIOSH (2001b) developed an alert, *Preventing Injuries and Deaths from Falls during Construction and Maintenance of Telecommunication Towers*, with recommendations for prevention.

The agency also partnered with OSHA and the National Association of Tower Erectors (NATE) to develop and communicate effective injury prevention strategies. NIOSH provided research input to OSHA in the development of a safety checklist and revision of a compliance directive, both of which provide guidance on safe work practices in the construction and maintenance of telecommunication towers. NIOSH research also supported OSHA's efforts to develop a train-the-trainer course for compliance officers, contractors, tower erectors, tower owners, wireless service carriers and tower component manufacturers. The course includes information from FACE investigations of tower-related deaths. NATE also distributed the safety checklist and alert to its membership.

Because nearly 100 workers are killed and more than 20,000 are injured in the highway and street construction industry each year, NIOSH (2001a) published *Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment*. This publication is now in its fourth printing with more than 14,000 copies distributed to date.

Recommendations in the document have been incorporated into safety materials by other organizations as well. For example, the St. Paul and CNA insurance companies provide their clients with risk management recommendations taken directly from the document; the Dallas Area Road Construction Work Zone Task Force incorporated the document's prevention measures into a best practices guide; and the Laborers' Health and Safety Fund of North America added the prevention measures as an appendix to its 2003 *Highway Work Zone Safety Manual*.

The scientific occupational injury prevention community is now recognizing that researchers also must take responsibility for ensuring that the results of their research are transferred to or toward workplace application.

r2p in Action

Several projects exemplify the types of activities the r2p initiative is designed to promote and enhance.

Personal Dust Monitor for Assessing Particulate Exposure

In collaboration with manufacturers, labor and industry, NIOSH developed a personal dust monitor (PDM) for assessing coal miners' exposure to coal dust in underground coal mines. The PDM provides real-time exposure data during a work shift and warns of potential overexposures in time for mine operators to reduce exposures that might lead over time to the development of black lung disease.

Hand Wipe Method for Detecting Lead

This technology quickly and easily detects the presence of lead contamination on skin and on hard surfaces in industries where lead is produced or used to a limit of identification of 15 micrograms per sample. The method is patented and commercially available under the brand name Full Disclosure (available from SKC Inc.).

A follow-up invention is the Handwipe Removal Method for Toxic Metals. Hands Off! (proposed brand name) has been evaluated by NIOSH to effectively remove Pb and other toxic metals from the skin. The method involves a system of skin decontamination that is skin safe yet extremely effective at removing toxic elements such as Pb, nickel, cadmium and arsenic. This technology is patent-pending and currently available for commercial licensing.

Injury Prevention in the Commercial Fishing Industry

In partnership with an engineering firm, NIOSH helped to produce a detailed, easy-to-read booklet recommending and describing engineering measures on commercial crab fishing vessels to prevent injuries in this highly hazardous industry. More than 3,000 copies of the booklet have been distributed in the U.S. and abroad. The recommendations in the booklet resulted from NIOSH's partnerships with many stakeholders to develop practical interventions that address hazards posed by machinery, fishing equipment, and the physical design and layout of fishing vessels.

At the request of the American Road and Transportation Builders Association (ARTBA) and National Safety Council (NSC), NIOSH provided research and assistance in the development of an OSHA 10-hour program specifically for the road construction industry. Both ARTBA and NSC provide the program to their members and this course serves as the core component of the Northeast Regional Safety Academy's road construction safety training program.

Implementing New Technologies, Processes & Practices to Prevent Injuries

NIOSH collaborated with BJC Health System to evaluate a best practices back injury prevention program in a cohort of 1,728 nursing staff over a 6-year period. The intervention consisted of mechanical equipment to lift physically dependent residents, training on using the lifts properly, a zero-lift policy and a preexisting medical management program. The study demonstrated that a safe patient lifting program could achieve highly significant reductions in injuries, workers' compensation costs and lost and restricted workdays among healthcare workers while improving the quality of care delivered to patients and nursing home residents. The study further demonstrated that the reduction in workers' compensation expenses recovered the initial capital investment in equipment and training in less than 3 years.

In addition to publishing the results in the scien-

tific literature, a user-friendly document based on these results was developed to provide guidance for developing safe patient lifting programs in other healthcare facilities. The document, *Safe Lifting and Movement of Nursing Home Residents*, was distributed to 15,000 nursing homes in the U.S. to stimulate widespread replication of these significant findings (NIOSH, 2006). Agency personnel also contributed to a new textbook that will be used in training nursing students. This textbook represents a significant effort to change the way patient lifting has been taught in nursing schools for the past 100 years.

Partnerships Are Key to r2p

Each of these examples of effectively communicating and transferring workplace injury prevention research to practice depends on partnerships with key stakeholders. In this spirit of partnership for prevention, NIOSH and ASSE signed a partnership agreement in October 2003 through which the two groups are combining efforts and expertise to improve safety and health conditions in workplaces across the U.S. The goals of the agreement are to advance the protection of workers, promote best practices, and encourage employers to develop and use safety and health management programs and effective prevention strategies and technologies. Under the partnership agreement, NIOSH and ASSE are committed to working cooperatively to provide outreach, communication and professional development opportunities regarding occupational safety and health, and to facilitate the transfer and implementation of effective workplace injury prevention measures.

By sharing and exchanging injury research and providing strategies to transfer workplace injury prevention research to practice, we move closer to the shared goal of moving science to solutions for the prevention of work-related injuries and deaths. ■

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Technology Safety Data Sheets

Moving critical safety information upstream to design engineers and downstream to workers

By Magdy Akladios and Gary Winn

CHEMICAL HAZARDS and methods to relate those hazards to workers, managers and designers have challenged SH&E professionals for many years. Incidents such as the catastrophe at Union Carbide's facility in Bhopal, India, led to a strong push for what is now known as the right-to-know movement (EPA, 2006). It also prompted several regulations, such as OSHA's Hazard Communication (HazCom) standard (29 CFR 1910.1200). Under this standard, OSHA mandates that all users of chemicals should maintain what are now called material safety data sheets (MSDS). Produced by chemical manufacturers, MSDS provide information such as manufacturer name and contacts, hazardous ingredients, physical data, fire and explosion hazard data, health hazard data, reactivity (instability) data, spill or leak procedures, special protection information and special precautions (ANSI, 1998).

Like chemicals, man/machine interactions have become more complex because of technological advances. This complexity increases the level of risk to which workers are exposed. As a result, identifying and assessing associated hazards has increased in complexity as well. To better manage these concerns, information sheets simulating MSDS for chemicals were introduced (McCabe & Lippy, 2001).

Called technology safety data sheets (TSDS), these documents aim to capture and relate a concise abstract of technical information in a user-friendly format. TSDS use information gathered through hazard analysis techniques such as job safety analysis (JSA) or failure modes and effects analysis (FMEA). Much as MSDS provide chemical hazard information to different audiences in one format, TSDS are communication tools to be used by various audiences.

According to Department of Energy (DOE) and National Institute for Environmental Health Sciences (NIEHS) (1996), a TSDS is a "technology-specific document designed to provide, among other information, the identity and relative risk of safety and health hazards associated with a technology. It can be used

as a tool to manage safety throughout the technology development and implementation process, and it can provide developers with a method to collect and report hazard information in a form understood by the user community."

History & Origination

TSDS was originally developed in 1994 by Matthew Fitzgerald while working under a contract for the DOE. In 1995, DOE entered into a cooperative agreement with the International Union of Operating Engineers (IUOE) to begin addressing worker safety and health considerations related to environmental technology research, development and demonstration programs (McCabe & Lippy, 2001).

In 2000, DOE's Environmental Management Advisory Board (EMAB) recommended that a TSDS be provided for every technology at mid-stage review (EMAB, 2000). DOE then began to pilot test TSDS as a way to provide guidance on avoiding potential hazards in individual technologies (McCabe & Lippy, 2001). Although it was later reported that mid-stage review was too early for full TSDS development, it was concluded that "it is never too early for a technology developer to start considering safety and health in the research and development process" (McCabe & Lippy, 2001).

TSDS Format

Currently no regulatory mandate is in place for a TSDS to be developed or for the format to be used if one is developed. However, published guidelines suggest that the following elements be included: technology identity, process

Abstract: *New technologies and processes can pose risks to users, much like those caused by exposure to chemicals. As part of the right-to-know concept, a standardized resource such as technology safety data sheets (TSDS) can provide workers with the adequate knowledge to protect themselves from those risks. This article describes TSDS and discusses how these tools can be used to educate managers, designers, engineers and other potential users on basic aspects of safety and health.*

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description, process diagram or photograph, contaminants and the medium, associated safety hazards, associated health hazards, phase analysis, safety and health plan required elements, comments and special considerations, and case studies (DOE & NIEHS, 1996).

The initial format compiled the elements outlined in OSHA's Process Safety Management (PSM) standard (29 CFR 1910.119) and presented them in a manner that could be used by employees who operate and maintain the technology, SH&E professionals charged with protecting personnel on hazardous waste sites and regulators who must write permits for technologies on state Superfund sites (Lippy, 2003). The initial format focused on processes themselves, and on the ways operators and maintenance personnel interacted with these processes. Depending on the complexities

involved, an appropriate hazard analysis technique was selected (e.g., what-if/checklist, hazard and operability study, FMEA, fault tree analysis).

Theoretically, the original format contained information accumulated throughout the entire process of development, demonstration and deployment of a technology. In its Policy for Occupational Safety and Health in Sciences and Technology Programs, DOE requires the use of TSDS, starting at appropriate points in the engineering development phase for maximum benefit (IUOE, 2002).

A second-generation format has emerged in the past 5 years. In this format, developers focus on worker issues such as behavior and willingness to take risks. Hence, hazard analysis techniques that focused on process safety no longer fit their objectives. Since JSAs focus more on tasks performed by

Table 1

Comparing PSM & TSDS Elements

Element	PSM	TSDS
Gather and display technology's information	<ul style="list-style-type: none"> •Information pertaining to the dangers of the highly hazardous chemicals used or produced by the process. •Information pertaining to the technology in the process (diagrams that will help users understand the process, and maintain it under control). •Information pertaining to the equipment such as condition's design must be documented (ASME, API, ANSI, NFPA codes). 	<ul style="list-style-type: none"> •Technology identity; •process description; •process diagrams. <p>These sections provide key technical information to people in order to understand the technology as is required by the standard.</p>
Hazard analysis	Based on this information, PSM will perform a PHA or safety analysis. Depending on the complexities of the process, an appropriate technique will be selected. Options include: what-if/checklist; HAZOP; FMEA; FTA.	<ul style="list-style-type: none"> •Safety hazards; •health hazards; •system safety analysis; •phase analysis. <p>No decision is made on the use of any hazard analysis technique. Section 7 in the first version of TSDS describes the results of a hazard analysis, but it does not determine how to do it. The latest protocols eliminate the section and stipulate the use of these techniques to determine an appropriate assessment of the hazards. Another important point refers to the format used by TSDS. It describes the results obtained in the hazards analysis by separating the hazards descriptions in to safety hazards, health hazards, phase analysis hazards and emergency conditions. Each topic constitutes a section.</p>
Operating procedures	PSM standard requires development and implementation of written operating procedures that provide clear instructions for safely conducting activities involved in each covered process. Steps for each operating phase are initial start-up; normal, temporary and emergency operations; normal shutdown; and startup following a turnaround or after emergency shutdown.	<ul style="list-style-type: none"> •Safety and health plan; •emergency condition information; •special considerations. <p>TSDS also present a specific section, namely phase analysis, to describe the hazards involved in each life cycle phase of the technology. This concept can help developers incorporate safety aspects into designs or to final users to address hazards during the use and deployment stage in the technology.</p>

a person and how well a procedure is executed, they are a more viable alternative. Therefore, process safety has given way to occupational safety in the effort to produce an effective communication tool.

Sutton (2003) suggests that occupational safety and process safety are both part of an overall system safety, but asserts that they are separate and distinct. He also suggests a relationship between system safety, occupational safety and process safety:

Indeed, during the follow-up to serious process-related accidents, it is often observed that the facility in question had a good occupational safety record, which is one reason senior managers are often so stunned after a major incident—their good occupational safety record had led them to believe that all was well. For these reasons, the line from occupational safety to process safety is not solid, indicating a weak link. On the other hand, a facility with a good process safety program probably will do well at occupational safety, so that line is solid, indicating a stronger link (Sutton, 2003).

Since worker safety is the ultimate goal, the second-generation TSDS format illustrates and communicates safety and health information to workers and combines both approaches into one source (Table 1).

Process Safety Management

The major objective of PSM is to prevent or mitigate the release of hazardous chemicals likely to cause serious accidents. To achieve this, PSM has three stages: identification, evaluation, and mitigation or prevention of chemical releases that could occur as a result of failures in process, procedures or equipment. To control such hazards, workers must develop the necessary expertise, experience, judgment and initiative to properly implement and maintain an effective PSM that includes gathering and displaying information, identifying and assessing hazards, and writing operating and training procedures (OSHA, 1994).

Three main sources of information are required to implement a PSM:

- information on the hazards of the highly hazardous chemicals used or produced by the process;
- information on the technology in the process (e.g., diagrams that will help users understand the process and maintain it under control);
- information about equipment conditions (e.g., pressure and temperature limits).

Based on this information, PSM uses a tool called process hazard analysis (PHA). Depending on the complexity of the process, an appropriate technique such as what-if/checklist, hazard and operability analysis (HAZOP), failure modes and effects analysis (FMEA) or fault tree analysis (FTA) is selected. Finally, the PSM standard requires development and implementation of written operating procedures that provide clear instructions for safely conducting activities involved in each covered process.

The TSDS format compiles these PSM phases and

expands their application beyond preventing or mitigating the release of hazardous chemicals to use with other types of work-related hazards. The TSDS presents hazards in a clear, comprehensible format, making it an important document for communicating hazards in any type of industry.

Proposed New Format

The lack of a standardized procedure and format has prompted the proposal of a unified approach. TSDS take advantage of hazard analysis techniques (or safety analysis methods). This systematic approach enables developers to analyze diverse objects, ranging from simple machine components to complex production processes. It also addresses ways in which operators and maintenance personnel interact with these processes. Thus, the first step in developing a TSDS is to recognize the nature of the object being analyzed. This will help to determine the approach and hazard analysis method to be used during the development of a TSDS.

Operation Analysis

Grimaldi (1975) defined the fundamentals of operation analysis as follows:

- 1) Break down the job or operation into its elementary steps.
- 2) List them in their proper order.
- 3) Examine them critically.

The operation analysis technique investigates the steps of a job to identify and eliminate those that are inefficient. SH&E professionals examine each step for its accident-causing potential. Four units—dubbed the 4 Ms—should be considered when analyzing a job operation for its possible hazards:

- man: all persons related to the job;
- method: working procedures;
- machine: simple tools to complex systems;
- material: includes substances and items other than machines.

Heinrich, Petersen and Roos (1980) explain how a production system should be divided into units to facilitate the identification of hazards. The same concept is presented by Harms-Ringdahl (2002) when describing a modern production system where the simple machine has been replaced by a production system. In this context, a production system “can be seen as a number of elements that must interact for a desired result” (Harms-Ringdahl, 2002).

The main components of a production system include technical equipment and physical conditions; individuals within the company; organization and activities; surroundings, including society.

Hazards are best controlled before they are created. However, if a designed system goes to market, worker behavior can be modified to avoid accidents. Therefore, a TSDS may be used with designers and/or workers and safety managers in mind.

Table 2

Hazard Analysis Techniques

Technique	Applications	Pros	Cons
Technical (T)		<i>Can give "strict" results</i>	<i>Human/organization missed</i>
Energy analysis	All types of systems	Simple method, quick, gives an overview.	Limited analysis of causes.
HAZOP	Chemical installations	Well known, many manuals, straightforward to use.	Time-consuming.
FMEA	Mechanical and electrotechnical systems; can be widened	Well established, international standard.	Time-consuming. Many possible failures.
FTA	All types of (technical) systems	Well established, international-standard; logical summary of causes of an accident; basis for probabilistic calculations.	Time-consuming and difficult; errors can be concealed; binary (yes or no).
Event tree analysis	All types of (technical) systems	Well established. Provides a clear picture of sequence of events after a failure. Basis for probabilistic calculations.	Rather difficult. Binary (yes or no).
Human (H)	<i>People's actions in systems</i>	<i>Human actions are essential</i>	<i>Difficult to model and predict</i>
Action error method (several similar ones)	Well-defined procedures in process industry, for example	Straightforward use, rather simple.	Focus on normal process. Many possible failures.
a) Hierarchical task analysis	Map out the task of an individual, all types of systems	Goal oriented, well structured description. A basis for further analysis.	Does not support identification of risks (not a real safety analysis method).
System (THO^a)	<i>Also organization oriented</i>	<i>Organizational activities are decisive</i>	<i>Difficult to model and predict</i>
Job safety analysis	Defined work procedure for an individual worker or a team	Simple to learn/apply; similar to traditional safety thinking.	Too traditional, new hazards not found; not suitable in automatic systems.
Deviation analysis	All types of systems	Generic; works on most systems, simple flexible principle.	Sensitive to structuring, many deviations at different levels.
Safety function analysis	All types of systems	Generic; works on most systems; focus on safety, making it right from the beginning.	Rather difficult, results can be presented in different forms.
Change analysis	All types of systems	General; simple principle.	Based on occurred accidents; assumes that the original system is safe enough.
a) Audits (in general)	Check of (safety) management; all types of systems	Essential to check that SM works. With a suitable checklist, it can be rather easy.	Depends much on the checklist; can be an empty formality; difficult to apply on flat organizations.

Note. From Safety Analysis Principles and Practice in Occupational Safety, by L. Harms-Ringdahl, 2002, New York: Taylor & Francis Inc.

^aTHO = technical, human and organizational aspects.

According to Harms-Ringdahl (2002), these four elements constitute a method of separating a job or operation, when analyzed, into simple compounds. Literature related to hazard analysis techniques offers a broad range of names for these techniques. While many of these techniques are similar, they may have different naming conventions due to lack of standardization of safety terminology and communication. The three basic thought processes by which hazards may be identified are:

- 1) deductive: based on a list of undesired events;
- 2) inductive: based on physical part failure modes;
- 3) inductive: based on human failure modes.

Developing a TSDS: What Works Best

More than 50 hazard analysis methods are available. Harms-Ringdahl (2002) describes 10 select methods based on the belief that these techniques are simple to apply and suitable for use in the work-

Example 1: TSDS Elements

Technology Safety Data Sheet

TSDS

2. Hazards Summary

<div> <div>Most Severe</div> <div>↑</div> <div>Severity</div> <div>↓</div> <div>Least Severe</div> </div>	IV		6c. Fire/ Explosion 7d. Biological	6a. Electrical 6b. Mechanical	6i. Confined Space	
	III	7e. Radiation	6j. Pressure 7b. Noise	6d. Trips, Slips, & Falls 6h. Overhead 6g. Elevated & Overhead 7c. Temp. Extremes		
	II	6f. Material Storage	8a. Material Handling 8b. Repetitive Motion 8d. Awk. Pstr / Static Motion	8c. Vibration 6e. Protrusions 7a. Chemical		
	I	6k. Trenching & Excavations				
		A	B	C	D	E

Least Probable

←

Probability

→

Most Probable

Risk Key

■ High

■ Serious

■ Medium

□ Low

Severity

I. Negligible

II. Marginal

III. Critical

IV. Catastrophic

Probability

A. Improbable

B. Remote

C. Occasional

D. Probable

E. Frequent

place. He also proposes a classification of techniques in three groups:

- Technically oriented: moves from specific to general; used to analyze equipment or components.
- Human oriented: for analyzing human errors and task; used to predict human errors in a defined task, and to consider what can go wrong.
- Organization oriented: involve all elements related to organizational activities such as how the work is performed and by whom, safety routines, etc.

Table 2 describes several of these methods, their area of application, and the positive and negative characteristics associated with them.

Table 2 describes several of these methods, their area of application, and the positive and negative characteristics associated with them.

Approaches for Different Audiences

Hazards are best controlled before they are created—that is, during the design phase of a process, system or technology. Designers can modify engineering aspects to design safe technologies before they go into production. However, if a designed system goes to market, worker behavior can be modified to avoid accidents. Therefore, a TSDS may be used with designers and/or workers and safety managers in mind.

Although the focus of a PHA is process safety issues, it will likely uncover occupational safety concerns and vice versa. TSDS developers must classify their findings and provide the right information to the right audience. This is when the TSDS takes on an important role as a communication tool.

First, workers need to know the hazards to which they are being exposed. Second, workers need to

know what protective measures to use to guard against these hazards. TSDS also provide information to designers to help them control hazards via design modifications. Not only is this important for the technology in question, it also provides subtle knowledge and helps educate non-SH&E professionals on the basic aspects of safety and health issues and the different ways to mitigate these risks.

To reach the level of standard communication tool, additional concepts must be described as well. For example, it is critical to clearly describe the technology, process or task (e.g., an entire installation, type of machine, specific machine, part or workplace as a production line or production process, transportation system, specific type of work, organizational routines) in which the engineers, worker or SH&E professional will be involved. Important issues related with this aspect are:

- display of information related to the technology, such as flow process diagram, schemes of different systems, and pictures and diagrams showing the steps to perform a task;
- use of brief operation description to understand the object or task.

A worker's risk perception as a consequence of hazard assessment will help modify his/her behavior. The worker can better visualize how risky a given technology or task is and his/her perception helps the SH&E manager to rank hazards and make appropriate decisions.

Since each organization has a unique way of char-

Advantages of TSDS

TSDS provide several advantages:

- 1) Multiple approaches to hazard identification reveal different hazards.
- 2) TSDS is the most thorough, comprehensive format of identifying, evaluating and controlling hazards in a single document.
- 3) TSDS allows a quantitative risk value and hazard rating to be calculated based on risk, which is the multiplication of the probability and severity. This resulting risk rating typically ranges from 0 to 4, with 0 being no hazard and 4 being the highest level of hazard. The latter is where one finds the potential for imminent danger to life or health.
- 4) TSDS acts as a checklist for designers, engineers, SH&E professionals, workers and other personnel on the different risks associated with the technology.
- 5) Educates non-SH&E professionals on safety issues.
- 6) TSDS acts as a legal document that safety measures has been accounted for and addressed.
- 7) TSDS describes the responsibilities of each person coming into contact of a particular technology.
- 8) TSDS holds designers and engineers accountable for unsafe designs.
- 9) TSDS acts as a reference for users of similar technologies to follow.

acterizing the degree of hazard, there is no standard methodology in this area.

Another consideration is the life cycle of the technology and all the different states that can occur from cradle to grave. These safety considerations apply during planning, design, production start, operation and decommissioning. MIL-STD-882B specifies general system designs requirements: Eliminate identified hazards or reduce associated risk through design, including material selections or substitution, and select those with least risk throughout the life cycle of the system when potentially hazardous materials must be used (DOD, 1984).

Selecting the Development Team

According to Harms-Ringdahl (2002), composition of the TSDS development team depends on what is to be studied, not necessarily the knowledge of the hazard analysis methodology. "An important advantage in creating a team lies in the way the analysis can be rooted at company levels. Through a stage-by-stage process of clarification and adjustment, results can become broadly accepted within the company" (Harms-Ringdahl, 2002).

Several problems can arise if just one person conducts the entire analysis (Harms-Ringdahl, 2002). Therefore, a multidisciplinary team must perform the hazard analysis that leads to the preparation of a TSDS; this team should include an expert in the technology under investigation; a potential user(s) of the technology such as a worker(s) with the skills needed to operate the technology; and experts with knowledge of the specific hazard analysis methodology to be used. In addition, if the technology poses a hazard that requires specific knowledge, an expert in that field must be present as part of the team (IUOE, 2002).

TSDS in Practice

One effective approach developed by IUOE (2002) arises from an adaptation of MIL-STD-882D (DOD, 2000). This method considers both probability and severity in a quantitative way. Simply, the standard requires that risk assessment be used in formulating decisions related to resolving identified hazards (Brauer, 1994).

Another approach was developed by the Indiana University of Pennsylvania's National Environmental Education Training Center (IUP-NEETC). This method evaluates probability as the chance of the hazard occurring only when the technology is in operation or under maintenance.

Figure 2

Example 2: TSDS Elements

3c. Uses

This section will provide both general and specific information on where the technology or components of the technology are applicable. This would include types of industries and processes where the technology has been used successfully in the past at other sites or facilities.

Additional information that can appear in this section includes :

- Benefits and advantages of process/technology.
- Why this technology may be chosen over another.

4. Worker Protection Measures

4a. Engineering Controls

Engineering modifications represent more permanent controls for protecting workers from safety and health hazards.

This section will provide a list of control recommendations that would offer the greatest protection and summarize the recommendations that appear in Sections 6, 7, and 8 of this TSDS document.

Examples for Thermal Desorption are provided in the next column:

- Install protective barriers at rear of trailer to protect electrical boxes from impacts and contact with vehicular traffic.
- Install safety guards on moving conveyor belt and the soil discharge pipe to prevent caught/pinch hazards and thermal burns.
- Install more permanent guide rails around trailer platforms to prevent falls from heights.
- Provide wash station for workers to decontaminant when they enter/leave soil treatment area.

4b. Administrative Controls

Administrative controls represent the second line of defense should engineering controls not be feasible or cost effective.

Examples for Thermal Desorption are provided in the next column:

- Rotate employee activities.
- Institute a double-check system for verifying procedures.
- Ensure workers sign in prior to entering work zone to be briefed on current site activities and things to watch for.
- Use spotters for any confined space work.
- Take regular breaks when temperatures extremes exist.
- Document employee allergy conditions.
- Use lift machines when heavy material is involved or repetitive lifting is required.

This technique also has a color-coded numerical rating that indicates the potential severity of injury and/or illness due to existing hazards. An important contribution to the TSDS format is the added visualization of the hazard assessment in an easy-to-understand color matrix.

Figures 1 through 6 provide examples of a TSDS for a thermal desorption technology at McClellan Air Force Base in Sacramento, CA (IUP-NEEC, 2003). This example shows the additions of hazard color-coding, which directs the reader to focus on the most important hazards first. Less-hazardous situations are also summarized, but are given secondary importance. The quantitative risk valuation and hazard rating is calculated based on the following formula:

$$\text{Risk} = \text{Probability of Occurrence} \times \text{Severity}$$

The five possible probabilities are:

- A = Improbable
- B = Remote
- C = Occasional
- D = Probable
- E = Frequent

The four possible levels of severity are:

- I = Negligible
- II = Marginal
- III = Critical
- IV = Catastrophic

The resulting four possible levels of risk are low (indicated by white), medium (indicated by yellow), serious (indicated by orange) and high (indicated by red).

Conclusion

While no standardized format is currently available to document and communicate technology-related hazards to workers, SH&E professionals, engineers or other personnel involved in the use of a given technology, such documentation is needed. A standardized TSDS can provide a clear description (both verbally and visually) of the technology, process or task in which the worker will be involved; incorporate hazard assessment information; and describe various situations arising throughout a system's life cycle.

When a multidisciplinary team is created to develop a TSDS, the analysis can be rooted at different company levels. Through a stage-by-stage process of clarification and adjustment, results can become broadly accepted within a given company.

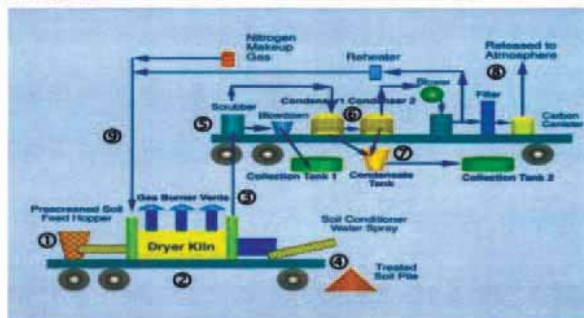
The ultimate goal of a TSDS is to identify key hazards and suggest solutions to mitigate them. As the examples show, TSDS

Figure 3

Example 3: TSDS Elements

3. Technology Description

3a. Process flow diagram



3b. How it works

This thermal desorption system performs low-temperature, ex-situ desorption. The system consists primarily of two trailers. The first holds the dryer kiln and the second houses the gas treatment equipment.

The contaminated soil is not heated above 1000 degrees Fahrenheit, which liberates the organic compounds, but prevents inorganics, metal, and semi-metals from being volatilized (freed) with the exception of mercury.

The soil is first fed (1) into a large, rotating dryer kiln (2) that elevates the temperature using an indirect and externally applied heat source (natural gas). Once the soil is "baked" and contaminants are volatilized, the liberated organics are directed and







carried to the gas treatment trailer using inert nitrogen gas (3). The treated soil from dryer kiln is stockpiled on the treatment pad at the discharge end of trailer (4).

On the gas treatment trailer, the contaminant mixture is introduced first into a wet scrubber (5) that serves to cool the gas, remove dust, and condense some of the organic vapors. Secondly, two condensing units (6) provide additional cooling and condense the remaining contaminant compounds out of the gas stream. The condensate from both condensers is collected in a storage tank for testing (7). The remaining gas stream is treated and then vented into the atmosphere (8) while the nitrogen carrier gas is re-circulated (9).

Figure 4

Example 4: TSDS Elements

4c. PPE

Work Area	Activities	Level of Protection	
All	Site setup, equipment assembly, inspections, site supervision and management, shipping, receiving, sampling, transport, and soil processing.	  	  
Feed soil storage area			
Treated soil staging/storage area			

4d. Safety Program and Worker Training

This section will provide a list of pertinent training and/or certifications that would be required of employees prior to working with the respective technology or process.

This could include employee check-off lists and employee training/orientation for new or transferred workers.

4e. Exposure Monitoring

This section provides industrial hygiene sampling results that may have been gathered along with any noise sampling/surveys conducted.

Recommendations for additional sampling can also be addressed here.

Brief details on sampling methods used and sampling location and duration will be included under this section.

4f. Medical Surveillance

This section will contain any existing records or previous monitoring results that may have been done with this technology at the current location or past applications at other sites.

This section can also contain a list of what allergies or adverse reactions employees may possess when exposed to certain chemicals.

Figure 5

Example 5: TSDS Elements

6i. Confined Space		Probability: (D) Rating	XXXXXX
		Severity: (IV) Rating	XXXXXX
Hazards	Recommended Controls		
<ul style="list-style-type: none"> During maintenance work requiring entrance into dryer kiln cylinder, engulfment, entrapment, inhalation, and asphyxiation hazards exist for worker. 	<ul style="list-style-type: none"> Implement confined space program and provide training. Always use a spotter when one or more workers are inside dryer kiln cylinder. Monitor air inside cylinder for oxygen deficiency and/or dangerous levels of gas/vapor. Obtain proper work permits for all worker to be done inside dryer cylinder. Ensure emergency response teams are available during this time in case they will be needed or called upon. 		
6j. Pressure		Probability: (B) Remote	XX
		Severity: (III) Critical	XX
Hazards	Recommended Controls		
<ul style="list-style-type: none"> Pressure and burst hazards exist to workers and equipment from piping and related connections between equipment on gas treatment trailer (scrubber, blowdown tank, condensers, blower, reheater, and nitrogen carrier gas system). 	<ul style="list-style-type: none"> Provide protective guards over piping and/or connections where pressure/burst hazards are likely or are a concern. 		
6k. Trenching & Excavations		Probability: (A) Improbable	XX
		Severity: (I) Negligible	XX
Hazards	Recommended Controls		
<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> NA 		

Figure 6

Example 6: TSDS Elements

8. Ergonomic Hazards			
8a. Material Handling/Lifting		Probability: (B) Remote	XX
		Severity: (II) Marginal	XX
Hazards	Recommended Controls		
<ul style="list-style-type: none"> During maintenance work requiring frequent movement of tools or equipment up and down access ladders to trailers, the potential for improper lifting and excessive weight loads exists. 	<ul style="list-style-type: none"> Use of a lift machine or platform can greatly reduce the number of physical trips workers would have to make up and down the dryer and/or treatment trailer(s). 		
8b. Repetitive Motion		Probability: (B) Remote	XX
		Severity: (II) Marginal	XX
Hazards	Recommended Controls		
<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> N/A. 		
8c. Vibration		Probability: (C) Occasional	XX
		Severity: (II) Marginal	XX
Hazards	Recommended Controls		
<ul style="list-style-type: none"> Maintenance work performed on motors and/or pumps from condenser, wet scrubber, blowdown tank, blower, and/or reheater units present potential for exposure to vibration to workers' fingers, arms, hands, and legs. 	<ul style="list-style-type: none"> Return motors, pumps, and equipment to "zero energy" state prior to beginning any maintenance or exploratory work. Use protective gloves designed to help absorb vibration when working on such equipment. 		
8d. Awkward Posture/Static Motion		Probability: (B) Remote	XX
		Severity: (II) Marginal	XX
Hazards	Recommended Controls		
<ul style="list-style-type: none"> None. 	<ul style="list-style-type: none"> NA 		
9. Emergency Measures			
9a. Evacuation			
<div style="border: 1px solid black; height: 100px; width: 100%; text-align: center; line-height: 100px;">Evacuation Map</div>			
<p>This section would contain set by step directions and instructions for workers and operators to evacuate all work zone areas in the event of a fire, spill, or explosion.</p>		<p>Instructions should evacuate workers to designated safe areas and include direction on accounting for workers and reporting incident(s) to appropriate response groups or individuals.</p>	

provides "recommended controls" for each hazard identified. Ultimately, if all these recommendations are followed, the risk chart should be moved from the red zone (high risk) to the white zone (low risk). ■

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Emergency Preparedness

Tabletop Exercise Improves Readiness

By Larry G. Holloway

The tabletop exercise technique maximizes learning in the minimum amount of time while consuming only a small amount of resources.

Full-scale emergency response exercises are well-known training tools. The process typically encompasses four main elements: 1) orientation seminar; 2) tabletop exercise; 3) functional exercise; and 4) full-scale exercise.

Although effective, the process is time-consuming and resource-intensive. This article presents a method for adapting the process into a cost-effective, results-oriented, time-managed approach. This method couples the orientation seminar with a mini version of the tabletop exercise as a means to improve emergency response preparedness in a manufacturing or office setting.

Understanding What's Involved

The steps used to create each exercise are basically the same. Select the team, brainstorm possible scenarios, review procedures, identify exercise responsibilities, list detailed exercise objectives, develop the scenario, conduct an orientation seminar, conduct the tabletop exercise, complete the critique, convey the lessons learned to everyone within the organization, and use an audit or assessment to confirm that the scenario has been

learned. The process is then repeated with a different scenario.

The orientation seminar and the mini tabletop exercise can be used effectively for sitewide exercises involving universal emergency scenarios such as severe weather, evacuations, hazardous vapor releases or threatening phone calls. The scenarios used here are an evacuation, a hazardous vapor release and a severe weather situation.

The evacuation scenario focuses on communications, assembly points and employee accounting. The cause of the evacuation could be a fire, a chemical spill or a power failure inside the building.

The hazardous vapor release scenario focuses on informing employees of the emergency, activation of hazardous vapor release shelters and their occupancy, and communications within the shelters.

The severe weather scenario focuses on actions by employees when various weather announcements are made, such as severe thunderstorm watches and warnings, and tornado warnings. Each announcement should elicit a different response from employees. Employees also must have a tornado shelter with enough capacity for

SPOTLIGHT Best Practices



Emergency Lighting

Pelican Products Inc. offers its 9450 Remote Area Lighting System to alleviate lighting problems in critical situations. Built for mobility, product features a multiangle telescoping light tower that extends up to 8 ft and becomes a high-powered spot beam when diffuser filter is removed. System is powered by a 17-hour rechargeable battery and can deliver an emergency charge to any 12 V device. Request 25 at www.psads.info.

Evacuation Marking

Kryptaglow paint, from **Co-leash Corp.**, is ideal for safety and emergency evacuations, as it emits a neon glow that can last up to 10 hours in complete darkness.

Made from the strontium group of photoluminescent pigments, paint can be applied to many materials, including concrete, plaster, wood, metal and plastic using a brush, roller or spray gun. Water-based paint also can be used as a protective top coat.

Request 26 at www.psads.info.



Solidifying Agent

CI Agent, from **Immediate Response Spill Technologies** is a polymer that solidifies oil, gasoline, diesel or any hydrocarbon on land or water. Once applied, the hydrocarbons turn oil and related chemicals into a solid, creating a cohesive, easy-to-remove mass. The resulting

nonhazardous material can be thrown away with regular trash. Request 27 at www.psads.info.

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everyone in the work area. A means of communication also must be provided in the shelter. The exercise will determine whether appropriate elements are in place in the procedure to adequately address the scenario.

Design Team Selection

Ideally, one or more representatives from each participating agency/group are needed. A team leader is selected. Each person is acquainted with the technique and the goal of the project.

Policies, Practices & Procedures

Design team members are asked to bring a copy of any policies, practices and procedures that could apply to the exercise. The team reviews these documents in detail so the team can gain an understanding of their scope and applicability for the proposed exercise.

Exercise Objectives

The objectives for each exercise are captured from the existing policies, practices and procedures that apply to the intended exercise. Each objective is incorporated into the exercise plan. Going into this detail helps to identify the capabilities that each participating group will need to use during the exercise. This information is then used during the orientation seminar to inform participants of what they need to be able to address during the exercise.

Scenario Development

The team works with the exercise objectives to develop the exercise scenario. Messages are then developed that relate to the objectives. Each message is designed to allow the receiving group to react in a manner associated with its policies, practices and procedures for the situation. The greatest

Evacuation Scenario

This exercise will test the department's emergency plans when an evacuation announcement is received regarding smoke in the building.

Exercise Objectives

- emergency notification;
- emergency evacuation;
- evacuation routes;
- assembly point location(s);
- personnel accounting.

Orientation Seminar

Participants are asked to ensure that their procedures are up-to-date and contain the elements necessary to implement an orderly building evacuation. These responsibilities include having emergency escape procedures, primary and secondary emergency evacuation routes, primary and secondary assembly points, and an employee accounting procedure.

Exercise Messages

From: Emergency Notification System, runner or personal observation

To: Employees at workstations

Text 1: Smoke is in the building and a work area evacuation is needed. Follow your division procedures.

Text 2: Evacuate to assembly point. Take proper actions as described in the division emergency plan.

Text 3: All clear. Return to worksite.

At the conclusion of the exercise, participants visit their primary and secondary assembly points.

amount of time is spent developing the scenario. Each message is carefully worded to elicit a response that would follow existing protocol and involve each participating group to varying degrees.

Best Practices continued on page 50

Property Loss Prevention

The 2007 Property Loss Prevention Resource Catalog, from **FM Global**, contains loss-prevention information to help plant, facility and risk managers prevent emergency situations such as fires, equipment breakdown or other natural damages. Full-color catalog offers a wide selection of learning kits, videos, property loss prevention literature, CDs and training courses. Resources also cover equipment hazards, facility and warehouse protection, construction and maintenance and emergency planning.

Request 28 at www.psads.info.



Instruction Device

SafetyMate SM303, from **SafetyMate Corp.**, is designed to save time in an emergency until professional help arrives. The emergency information device provides reliable, comprehensive, audible and interactive communication to those administering aid to an injured person by verbally instructing what should be done. The device helps refresh previously learned emergency training, possibly reducing panic that may occur during an emergency. Product has instructions for many emergencies, including choking, amputation, convulsions, electric shock, fractures and bleeding.

Request 29 at www.psads.info.



Indoor Air Monitor

RAE Systems introduces the MiniRAE 3000, a third-generation photo ionization detector (PID). Product allows user to identify safety and security threats in real time in industrial, environmental monitoring, indoor air quality and hazardous materials response applications. Featuring a large backlit display, a built-in flashlight, more than 200 built-in correction factors and an optional Bluetooth interface, product has a wide measurement range. Device is intended for use where hydrocarbon-based chemicals might pose a toxic threat and can be used for both leak detection and industrial safety.

Request 30 at www.psads.info.



Heat Injury Prevention

Emergency Film Group has produced a training program entitled *Heat! Working in Hot Environments*, for firefighters, HazMat teams, industry personnel and others who might encounter emergency heat injuries. Video uses animation sequences and live-action footage, and it covers different types of heat injuries, and symptoms and treatment of each. Video also covers how heat is transferred, symptoms of heat stress, how chemical protective clothing can increase risk of injury, and how to avoid injury and medical monitoring. An accompanying guide outlines a 4-hour or longer training seminar.

Request 31 at www.psads.info.

Orientation Seminar

The orientation seminar is a critical step. It helps ensure a successful tabletop exercise because it is used to introduce new programs, policies, practices and procedures to participants. It allows for the review of roles and responsibilities associated with the proposed exercise, and serves as the starting point for the exercise process.

During the seminar, existing policies, practices and procedures are reviewed with the participating groups and specific exercise objectives that each group would be expected to encounter during the exercise are identified. This allows each group to ask questions and to discuss how they will interact with other groups before the actual exercise.

The seminar is conducted 2 to 8 weeks before the actual tabletop exercise. This gives each group time to review and revise existing procedures, and

Severe Weather

The purpose of this exercise is to be sure each division/department has a severe weather procedure in place that would address different severe weather announcements and identify adequate tornado shelters for their workforce. Each alert requires a different level of activity.

Exercise Objectives

- notification to employees by the plant phone operators;
- division notification procedures;
- procedures that include sections for severe weather watches/warnings and tornado warnings;
- identify area for tornado shelter (basement or lower floor; away from windows and doors; interior of building; protected or reinforced area).

Orientation Seminar

Each department must address the differences between severe weather watches and warnings, and tornado warnings in their procedures. The seminar setting is an ideal opportunity for each group to brainstorm how these situations will be handled in their respective areas.

Exercise Messages

From: 24-Hour Contact Center/Division Communications Center

To: Employees at workstations

Text 1: A severe thunderstorm watch has been issued for this area. Follow the division procedures.

Text 2: The severe thunderstorm watch has been upgraded to a severe thunderstorm warning. Take proper action as described in your procedures.

Text 3: The severe thunderstorm warning has been upgraded to a tornado warning. Take appropriate protective measures as specified in your procedures.

Text 4: The tornado warning has been terminated. This concludes the exercise.

train on the procedures, which increases the likelihood that each group will have a successful exercise. It also reduces the likelihood of a person or group being embarrassed because they did not know what to be prepared to do during the exercise.

The Tabletop Exercise

The purpose of the tabletop exercise is for participants to practice problem solving, to resolve questions of coordination and to assign responsibilities in a nonthreatening format under minimal stress. A scenario is presented using sequential messages that are given to a select individual, group or to all present. Responses can be written on the bottom of the message form or discussed as a group. At the conclusion of the exercise, a self-evaluation is conducted. The goal is to provide a pleasant learning experience coupled with improved awareness of possible emergency situations.

The exercise is conducted in a conference room setting. A computer, projector and screen are used to display the exercise messages, pictures, floor plans, videos and other neces-

Rescue System

FrenchCreek Production Inc. announces the U-RES-Q rescue/recovery system for emergency fall protection. Product alleviates suspension trauma but allows a capable worker the option of climbing back to the anchor point. Used in conjunction with a full-body harness and a complete fall prevention/rescue program, the system may be used as an option for many shock-absorbing lanyards. Product is lightweight and releases into rescue mode by automatically ejecting a high-strength, 16 in. rescue ladder so the worker can climb back to safety or relieve suspension pressure, increase blood flow and ensure enough time for emergency response.

Request 32 at www.psads.info.

Crisis Response

ESS introduces the ESS Crisis Information System to help organizations manage any crisis from industrial accidents to natural disasters. The system can adapt to fit any incident management structure to provide fast, reliable management for real-time responses. It is available as a secure hosted, on-demand or on-site system. Product features automated remote notification

with text-to-speech technology; online mapping with bird's eye, satellite and aerial imagery of a specific site; emergency message center; and task tracking for monitoring operational progress.

Request 33 at www.psads.info.



Emergency Label Maker

Brady Corp. introduces the GlobalMark2 Industrial Label Maker, an easy-to-use printer that produces labels, emergency signs and exit markings, warning signs and pipe markers at the point of need. Product offers built-in templates, graphics and applications for arc-flash labels, OSHA and ANSI warnings, machine guard labels, glow-in-the-dark emergency exit paths and general facility identification. Product features a built-in cutter and prints in one color, multiple spot or blended colors.

Request 34 at www.psads.info.



Hazardous Vapor Release

The purpose of this exercise is to have employees test their department emergency plans when a hazardous vapor release announcement is received.

Exercise Objectives

- emergency notification;
- existence and certification of temporary havens/critical control rooms;
- communication capabilities;
- local and remote shutoff capabilities.

Orientation Seminar

The rationale behind the seminar is to ensure that each department has an adequate hazardous vapor release plan in place and that the plan includes a notification system, and certified temporary havens/critical control rooms which are adequate for the number of employees and contractors in the area. These rooms must be accessible at all times, have local and remote shutoffs, a phone and a two-way radio.

Exercise Messages

From: 24-Hour Contact Center/Division Communications Center

To: Employees at workstations

Text 1: There is a hazardous vapor release that impacts this zone. Proceed to the closest temporary haven/critical control room.

Text 2: The hazardous vapor release is expected to last an additional 20 minutes. Please stay in the temporary haven/critical control room. Updates will be issued as appropriate.

Text 3: The hazardous vapor release is terminated. Complete the next two parts of the exercise at this time. Visit your temporary haven/critical control room and your assembly point at this time, then return to your normal workstations.

sary aids. The agenda includes:

- purpose and definition for the exercise;
- who, what, when, where and why for the exercise;
- exercise objectives for each group;
- exercise and critique (including a follow-up plan).

The protocol for the exercise is explained to the groups and questions can be asked before the exercise starts. Background information such as setting, weather, location and any other pertinent information are presented as well.

Once these activities are complete, the first message can be shown on the screen. Each message has an intended purpose. The group gives its responses based on existing policies, practices and proce-

dures. Discussion is permitted at the discretion of the exercise controller. After each message is discussed in detail, the next message is given and the process is repeated until the end of the exercise.

Critique

After the exercise is concluded, a critique is performed to discuss items done well and opportunities for improvement, and to determine the path forward. Answering these questions facilitates the discussion:

- 1) How can the exercise be improved?
- 2) What needs to be changed?
- 3) Was the exercise too detailed, too narrow in scope, too general?
- 4) How was the timing?

Conclusion

The mini tabletop exercise technique maximizes employee learning in the minimum amount of time while consuming only a small amount of resources. Key to a successful exercise is the effective use of the orientation seminar. This seminar reveals the "roadmap to success" by identifying the elements that need to be addressed during the exercise.

Larry G. Holloway, CSP, MEP, is president of LGH Safety Services LLC, Kingsport, TN. He is a professional member of ASSE's Northeast Tennessee Chapter and can be reached at lgolloway@prodigy.net.

Bloodborne Pathogens

National Safety Compliance has released its 2007 *Bloodborne Pathogens* training program that covers all of the OSHA-required information. Topics include practices to prevent exposure; emergency procedures; post-exposure follow-up procedures; PPE; exposure control plan; signs, labels and containers; epidemiology and symptoms of diseases; and modes by which diseases are transmitted. Product is available on VHS or DVD with a complete leader's guide.

Request 35 at www.psads.info.



Emergency Eyewash

Cederroth Industrial Products' Cederroth Eyewash neutralizes and renders harmless splashes from acids or alkalis, while diluting and washing away the dangerous substance. Eye cup channels the fluid directly to the eye, avoiding spills and allowing a steady flow of liquid. The shape also helps keep the eye open during rinsing. Bottle opens automatically after twisting it out of its wall bracket.

Request 36 at www.psads.info.



Biohazard Detector

MSA's BIOSENSOR 2200R biological agent detector is a handheld, portable device that is used for fast detection and analysis of biological agents. On-site analysis during white powder emergency response calls allows for rapid detection. Device is easy-to-use, and has a low false-positive rate of detecting substances such as smallpox and anthrax. Wet or dry samples may be tested and retained as evidence for up to 12 months. Product also features positive and negative control cartridges, battery-operated capabilities, visual and audible alarms and integrated radio frequency identification for automatic cartridge recognition.

Request 38 at www.psads.info.

Fire Protection

The Farenhyt IFP-100 fire alarm system, from **Silent Knight**, a Honeywell company, combines analog/addressable devices with a cost-effective control panel. Product features a digital communication protocol that uses standard wiring, 127 addressable points, single button reset and silence functions, a built-in digital communicator, a programmable zone or point reporting capability, enhanced user interface and programming capability from the on-board user interface.

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Product Pulse

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Safety Sign

Danray Products LLC introduces its safety sign for drilling machines. The sign complies with ANSI Z535-2006 series of standards for the design, application and use of signs, colors and symbols for accident prevention.



Product addresses the main safety hazards created by rotating chucks and tools on drilling machines, and is equipped with a high-bond-strength acrylic adhesive that has chemical resistance and holding strength at temperatures up to 350 °F. Request 40 at www.psads.info.



Lockout Storage

The Combined Lock Storage/Group Lock Box, from Brady Corp., is equipped with two compartments: one for storing padlocks when not in use, and the other for securing keys during group lockouts. Product features a metal construction and a window in the group lockout compartment for easy viewing. Product can hold up to 34 padlocks and can store up to 125 padlocks. Request 41 at www.psads.info.

Clean Fire Extinguishants

DuPont Fire Extinguishants introduces its line of clean agent fire extinguishants. Clean agent technology ceases the combustion process through heat absorption and chemical interaction at the molecular level. Clean agents are electrically nonconductive and noncorrosive, so they are safe for sensitive electronic equipment and safe for use in facilities where people are present. They leave no residue that can cause costly post-fire cleanup and downtime.

Request 42 at www.psads.info.



Fire Safety

Fire-Lite Alarms introduces the MS-9050UD addressable control panel. Product's power supply and electronics are contained on a single circuit board housed in a metal

cabinet. System status transmits to a central station via the public switched telephone network. Key features include a fixed trouble relay, a built-in programmer and two programmable relays. Request 43 at www.psads.info.

Single Gas Detection

MSA introduces the ALTAIR family of gas detectors and test equipment, designed to provide a range of options for single-gas detection and instrument maintenance needs. Series includes the ALTAIR and ALTAIR Pro single-gas detectors, as well as the ALTAIR QuickCheck Station and Galaxy Automated Test System.

Request 44 at www.psads.info.



Weatherproof Lights

Certified by the National Sanitation Foundation, LDPI Inc.'s Lighting 376 Series wet/damp fluorescent light fixtures are designed for use in harsh environments. Product features a poured-in-place polyurethane gasket and latch that gives continuous positive gasket contact while sealing enclosures from hostile environments. Request 45 at www.psads.info.



Eye Protection

Lightning protective eyewear, from North Safety Products, provides a secure, comfortable, ergonomic fit. Product features slip-resistant nosepiece, self-adjusting temples, comfort pads and a chemical- and heat-resistant frame. Eyewear accepts prescription lens inserts and is offered in four lens shades.

Request 46 at www.psads.info.

Fall Protection

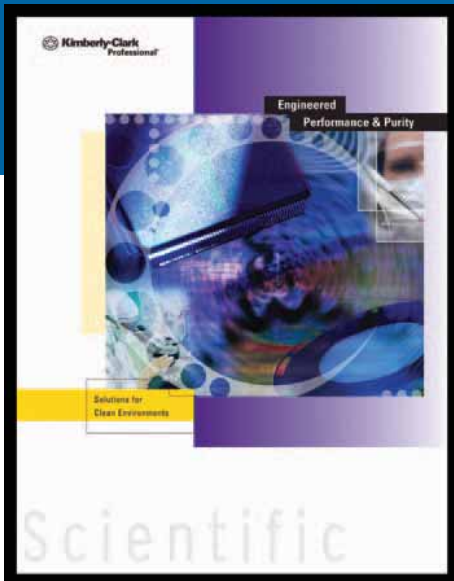
Kee Industrial Products' fall protection systems catalog features its temporary and permanent fall protection railing systems and safety accessories. The catalog describes products as free-standing, modular guardrail systems that can be designed to fit almost any flat or low-sloped roof, accommodating roof edges, access points, stairs, walkways and maintenance equipment.

Request 47 at www.psads.info.

Machine Guarding

Rockford Systems' Ex-AI Guards are constructed to meet OSHA regulations and ANSI standards to safeguard personnel from point-of-operation hazards on equipment and machinery. Guard attaches directly to a machine using mounting bracket hardware.

Request 48 at www.psads.info.



Cleanroom Products

Kimberly-Clark Professional has published a catalog of products designed for laboratories, cleanrooms and clean manufacturing environments. Catalog provides detailed product information on the company's Kimtech brand products, including Kimwipes wipers and Pure Critical task wipers for cleanroom environments, as well as Kimtech Pure cleanroom gloves and Kimberly-Clark laboratory gloves. **Request 49 at www.psads.info.**

Safety Gate

Protect-O-Gate Pivot Gate, from Benko Products Inc., is ergonomically designed to prevent worker access to mezzanine ledge when materials are being moved, eliminating the potential for falls and other incidents.

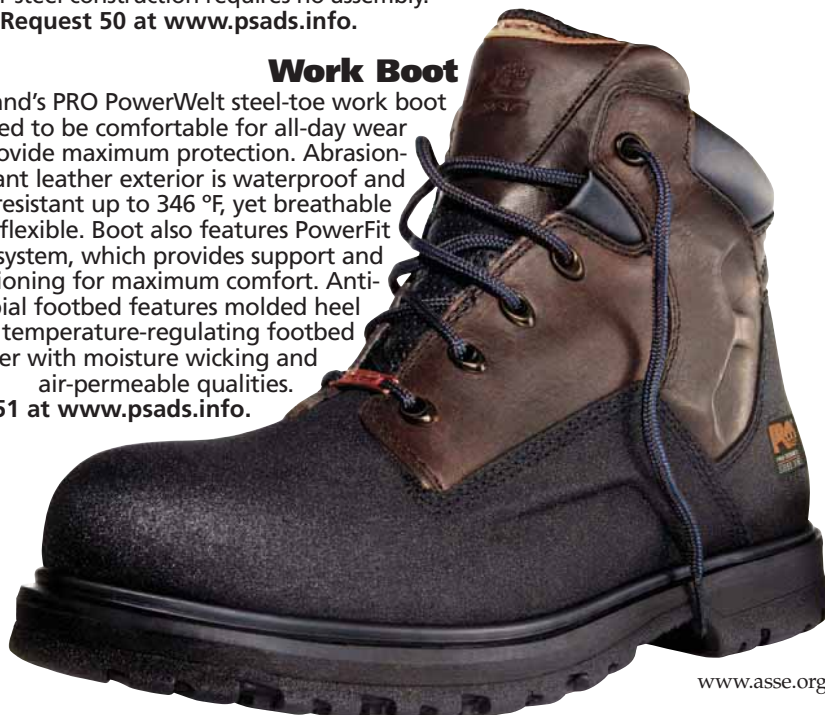
Tubular steel construction requires no assembly.

Request 50 at www.psads.info.

Work Boot

Timberland's PRO PowerWelt steel-toe work boot is designed to be comfortable for all-day wear and to provide maximum protection. Abrasion-resistant leather exterior is waterproof and heat resistant up to 346 °F, yet breathable and flexible. Boot also features PowerFit comfort system, which provides support and cushioning for maximum comfort. Anti-microbial footbed features molded heel cup and temperature-regulating footbed cover with moisture wicking and air-permeable qualities.

Request 51 at www.psads.info.



Welding Helmet

Miller Electric Manufacturing Co. introduces the Performance Series auto-darkening welding helmet. Designed for professional welders who work for extended periods, helmet features three arc sensors that quickly darken the lens between shades. Auto-on/auto-off feature automatically activates the lens shade, while grind mode stops the lens from darkening during grinding. Additional features include magnifying lens holder and quick-release front lens cover. **Request 52 at www.psads.info.**



Impact Protection

Konstant's Protect-It column-protection device minimizes the damage caused to pallet racking in the event of forklift impact. Device attaches by hand to a column without additional fasteners. Width can be adjusted to fit a wide range of sizes, and a spring clip enables a secure grip to any column. Upon impact, it absorbs at the front and sides to provide protection to columns and deforms to resist the impact. Product returns to its original shape once impact is over. Available in recognized safety colors, device is also effective in cold areas as low as -40 °F.

Request 53 at www.psads.info.

Highway Safety

Anchor 60, from Plastic Safety Systems Inc., gives increased stability as a barricade system and provides up to 120 lb of sand for each barricade. Product features an ergonomic handle, rubber nonskid pads and an oversized sand fill hole. It also accepts plastic and steel uprights, and it is molded of high density polyethylene.

Request 55 at www.psads.info.

HexChrom Training

Coastal Training Technologies Corp. has released a new training program to help companies comply with OSHA's updated hexavalent chromium standard. Available on DVD and video, *Hexavalent Chromium Awareness* covers the health effects of HexChrom, newly reduced exposure levels, engineering controls and required medical surveillance of exposed employees.

Request 54 at www.psads.info.



IAQ

TSI Inc. has redesigned its line of anemometers and indoor air quality instruments to provide highly accurate, fast and easy-to-use instrumentation for serving building service contractors, commissioning specialists, facility engineers and research professionals. Thermal anemometers feature intuitive operation and a large display to view measurements. LogDat2, an easy-to-operate software package, simplifies data logging and reporting, while USB and Bluetooth technology enable fast data download and wireless on-site printing. Lightweight, compact IAQ units can make quick, accurate, real-time measurements of key IAQ parameters.

Data can be saved and statistics reviewed on the instruments. **Request 56 at www.psads.info.**

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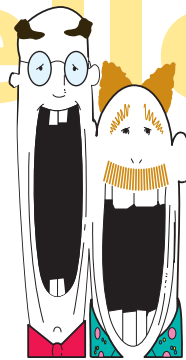
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"Creativity is the ability to see the ordinary as extraordinary."

—Dewitt Jones

Get TALKING

Susan RoAne, author of *How to Work a Room: Your Essential Guide to Savvy Socializing*, has some great tips for making connections at events.

- **Think analog, not digital.** Tough to do in today's digital world, but it's important to meet, mingle, make small talk and connect with others.
- **Prepare for every event.** Take note of news on where you're going and who you'll meet.
- **Determine what you have in common with others at the event.** When you find a common point, you both will be more comfortable. If you focus on making others comfortable with you, they will be.
- **Prepare a self-introduction.** Be ready to briefly (7 to 9 seconds) introduce yourself and key it to the event so others know why you are attending.
- **Read voraciously.** Blogs, online and print newspapers, industry journals—all have information that is fodder for conversation.

■ **Approach the person standing alone.** No one wants to stand in a room alone.

■ **Just smile and say "Hi" or "Hello."** According to research, those are the best opening lines.

■ **Make small talk.** Small talk is how we learn about our common interests, experiences and connections.

■ **Listen, listen, listen.** People tell us about their interests. If we would listen and stop planning what to say or do next, we'd all be better conversationalists.

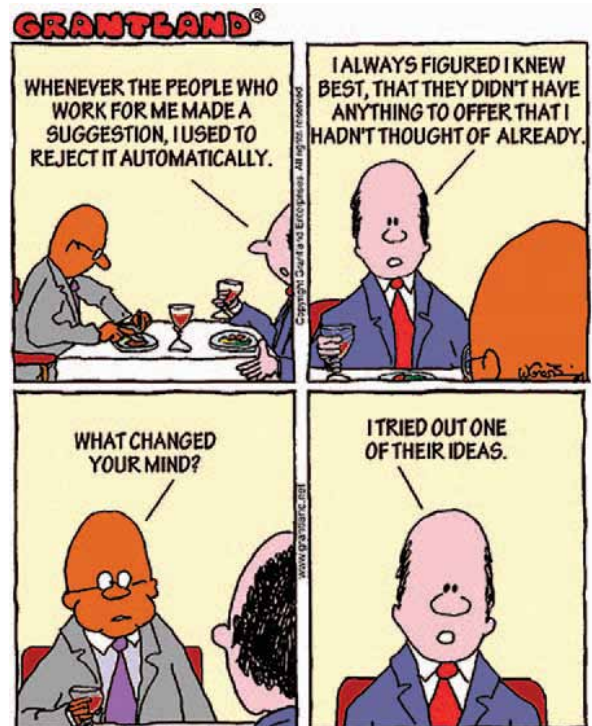
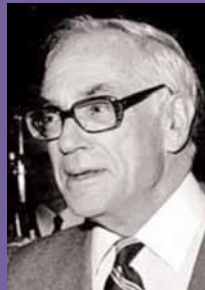
■ **Go everywhere with the intention of having fun.** People want to be around the upbeat, fun, interesting and interested person.

A Politician in Captain's Clothing?

Christopher Columbus may have been the best politician in history. He started out not knowing where he was going and when he got there he didn't know where he was. He returned not knowing where he had been, and he did it all on a big cash advance. Best of all, he got a repeat order.

"Those who enjoy responsibility usually get it. Those who merely like exercising authority usually lose it."

—Malcolm Forbes



August SAFETY PHOTO OF THE MONTH



Talk about getting an extension.
Cindy Monges,
Morgan Hill, CA

Keep 'em Interested

If your SH&E committee has been meeting regularly for a while, it can be hard to keep the team interested. Richard Hawk of makesafetyfun.com offers these ideas for keeping it fresh:

- 1) Encourage the team to experiment. Repetition dulls anything. Try new things. Brainstorm with no limits. Have the team design a fun and unusual SH&E marketing plan.
- 2) Reduce the rehash. You've probably discussed hazard X at the last 25 meetings and nothing has changed. Drop it and don't talk about it for a while. Rehashing is tedious and boring.
- 3) Publicize accomplishments and give the team credit. Use posters, e-mail, table tents, personal contacts and signs to get attention. Look for opportunities in all situations to publicize the team's deeds and milestones.

Fast Facts

- ✓ The average price of a regular-size hot dog at a major league ballpark is \$3.38.
- ✓ The average U.S. household receives 104.2 TV channels, but watches just 15.7 of them regularly.

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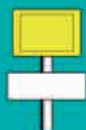
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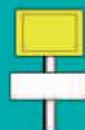
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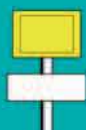
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